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ABSTRACT

Twenty-two facets of the world population problem are explored. The topics are economic, social, ecological, and political in nature and generally portray the stresses and strains associated with continued population growth in a world inhabited by four billion people. These aspects of the population problem are discussed: literacy, oceanic fisheries, natural recreation areas, pollution, inflation, environmental illnesses, hunger, housing, climate change, overgrazing, crowding, income, urbanization, deforestation, political conflict, minerals, health services, water, unemployment, endangered species, energy, and individual freedom. The authors conclude that analysis of the implications of population growth based on these indicators suggests strongly that the threat posed by uncontrolled growth deserves more attention from national and international leaders than it is presently getting. A bibliography of selected readings is included. (Author/DB)

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Worldwatch Paper 5

Twenty-Two Dimensions of the Population Problem

Lester R. Brown, Patricia L. McGrath, Bruce Stokes

March 1976

Worldwatch Institute

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Preface

According to the best demographic estimates, the world's present population of 4 billion may reach nearly 7 billion by the end of the century, and may go as high as 12 billion before levelling off. It is doubling, at the present rate, every 37 years.

The prospect of developing social and economic structures capable of carrying this weight of numbers is formidable, given the complexity of the interrelationships, some of which are described in the following pages. Nevertheless it is a task which cannot be put aside, because the consequences of neglect are too terrible to contemplate.

As this paper points out, population growth and other aspects of human development are directly linked. "Slower population growth" is not a magic formula which will solve all of our problems. It is one of the means to an end—of achieving a tolerable life for all—and is itself complex and difficult to achieve.

The United Nations Fund for Population Activities has supported this research project by Worldwatch Institute to help deepen public understanding of the population question. Our support for this work and for a study to follow, which will analyze recent trends in population growth and family planning, is part of an ongoing UNFPA effort to relate population growth to economic, social, and political concerns.

Rafael M. Salas
Executive Director
United Nations Fund for Population Activities

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Introduction

The most widely cited population expert in the world today is Thomas R. Malthus, an English clergyman who wrote his major treatise on population nearly two centuries ago. In his classic work, *An Essay on the Principle of Population*, he focused on the relationship between population growth and food supplies. His lasting influence on demographic thinking is due in part to the simplicity of his thesis and in part to the fact that only limited research has been done on other aspects of the population problem since then.

Malthus believed that population tends to increase geometrically while food supply increases arithmetically. Though this has proved only partly true, he was quite right in his broad contention that population growth often presses against food supplies. During the two centuries since he wrote, famines have claimed countless millions of lives. Famine and the threat of famine are still commonplace. Hundreds of thousands have starved to death during the seventies in Ethiopia, Somalia, the Sahelian zone countries, and in Haiti, Honduras, and Bangladesh. Worse, hundreds of millions still suffer from severe calorie and protein malnutrition.

With the exception of the population-food relationship, population studies have been pursued mainly by demographers who have succeeded in clarifying those human aspects of the population equation that are quantifiable. They have measured population sizes, rates of growth, composition, and fertility levels, and devised techniques for building models and projecting population trends. This single-minded focus on demographic analysis has been at the expense of attention to the many consequences of population growth that might properly concern economists, ecologists, meteorologists, political scientists, urban planners, and many other specialists. Because the implications of population growth embrace so many disciplines, they have been the primary focus of almost none.

The food dimension of the population threat remains paramount, yet in their Malthusian mindset, population analysts often neglect the threat's numerous other, often newer, manifestations. In this paper we have selected twenty-two dimensions of the population problem, including hunger, that deserve attention. Selection of the problems discussed was based simply upon evidence that population growth contributes in some degree to each of them—rising affluence, economic mismanagement or inappropriate technologies may also contribute directly or indirectly.

The amount of research and data available on the relationships between population growth and the problems it aggravates varies widely. Though one could fill a small library with literature on the population-food relationship, little, if any, hard data details the relationship between population and such critically important issues as inflation or political conflict.

Some of the facets of the population problem explored in this monograph are economic, some are social, some are ecological, and some are political, but nearly all have one thing in common: they can be expected to get much worse before they get better. Collectively, they portray the stresses and strains associated with continued population growth in a world already inhabited by four billion people.

"Women's minds
are being bound as cruelly
as once their feet were."

. . . and Literacy

More than five centuries have passed since Gutenberg invented the printing press, yet one-third of the world's adults lack the skills to use this Renaissance technology. In many countries of Asia, Africa, and Latin America, the number of illiterates is rising as population grows more rapidly than schools can be built and staffed with teachers. Millions of children move toward adulthood without any instruction at all; others enroll in the primary grades but drop out without ever learning to read or write.

Those countries with the least to spend on education and literacy usually have the highest birth rates. Not only are funds in short supply, but the pyramidal distribution of age groups in a rapidly growing population also means that the ratio of trained teachers to school-age children is often decreasing. As a result, many governments once committed to universal education have quietly abandoned this objective.

In 1950, 700 million illiterates comprised about 44 percent of the world adult population. Today, more than a quarter century later, there are 800 million illiterates. While the percentage of illiterates declined from 44 percent to 34 percent between 1950 and 1970, the absolute number unable to read or write has continued to grow. Illiteracy is most acute in areas with rapid population growth; in many African and Arab states over 80 percent of the women and 60 percent of the men are illiterate.

The number of illiterate females has been growing faster than the number of illiterate males; women constitute almost two-thirds of the world's 800 million illiterate adults. Helen Callaway, an American anthropologist studying nonliterate societies, has concluded that economic development and the expansion of primary education have broadened the gap between men and women. Nearly everywhere males are given preference for general education and for technical training: "They are the ones who are encouraged to venture into the wider world." Women's minds, on the other hand, are being bound as cruelly as once their feet were.

Rapid population growth, apart from its effects on the quality and quantity of education, tends to curtail the contribution of education to greater social equality. The lack of minimum educational facilities entails the sacrifice of programs to alleviate inequalities between boys and girls, between rural and urban areas, and between favored and poorer sections of society.

The impact of population dynamics on education also affects the family. Research conducted in a variety of countries and cultural contexts suggests that, when combined with poverty, large family size and closely-spaced pregnancies hamper the development of children's cognitive, verbal, and motivational capacities as well as their health and physical development. The difficulty that parents of large families have financing the education of their children compounds the problem.

To the extent that rapid population growth retards expansion of educational programs, it fosters ignorance in a world that can ill afford it. Literacy is crucial as a means of informing people of the need for change and for stimulating acceptance of new ideas. The modern world is very much a world of words, and despite the new opportunities for learning made possible through radio and television, the illiterate person is severely handicapped. For much of mankind, literacy is the door into the twentieth century, the means of improving the quality of life, achieving social mobility, and participating in the world's affairs.

Illiteracy has a political dimension as well. In a world of nation-states, each country must govern itself effectively if it is to remain viable. And in this process, education is a key element. Moreover, deepening interdependence among countries means that international cooperation is essential to the survival of civilization. Sensible cooperation between nations requires a degree of human rationality that can be more readily achieved in a literate, well-informed society, but not easily, if at all, in one that is uninformed and in which intellectual capacities remain undeveloped.

"While population continued to grow, the average per capita supply of fish declined 11 percent during this three-year span, triggering dramatic price rises."

. . . and Oceanic Fisheries

The hope that man will be able to turn to the oceans to satisfy his food needs as population pressure on land-based food resources mounts is being shattered. Newspapers in Tokyo, London, and Lima tell daily of increasing competition in oceanic fisheries and growing conflict among countries over scarce supplies of fish. Overfishing is commonplace and pollution of the oceans worsens steadily.

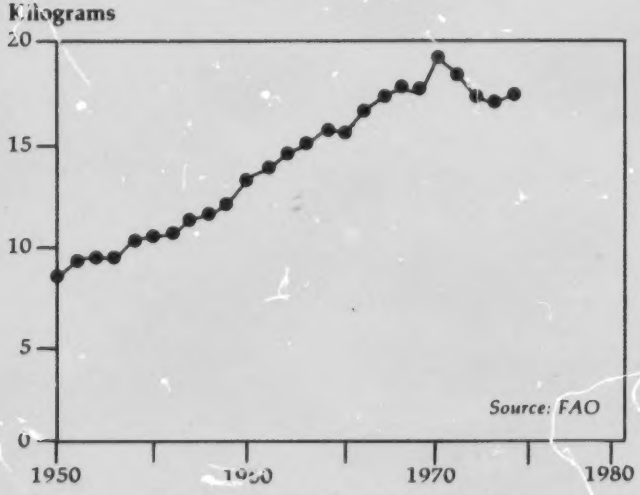
The annual world fish catch of close to 70 million tons (liveweight) represents one of humanity's major sources of high quality protein, substantially exceeding the world slaughter of beef. From 1950 to 1970, the world fish catch more than tripled, from 21 to 70 million tons. This phenomenal 5 percent annual growth in the fish catch far exceeded world population growth, raising average fish consumption per person from eight kilograms in 1950 to 19 in 1970.

In the five years between 1965 and 1970 alone, the world fish catch increased by 18 million tons, or 35 percent. If that trend had continued, the 1975 catch would have been about 95 million tons. But between 1970 and 1973, this longstanding trend was reversed and the fish catch declined by nearly 5 million tons. While population continued to grow, the average per capita supply of fish declined 11 percent during this three-year span, triggering dramatic price rises. (See Figure.) The 1974 catch is estimated at 69 million metric tons, a million tons short of the 1970 catch.

As stocks of key commercial species wane, the time and capital expended to bring in the shrinking catch rises. Many marine biologists now feel that the global catch of table-grade fish is at or near the maximum sustainable level. Of the thirty or so leading species of commercial-grade fish, a number are now overfished: that is, stocks will not sustain even the current catch.

Without cooperative global management of oceanic fisheries and control of the swelling flow of pollutants, the catch could decline

even further. The problem is not merely the possibility of diminishing returns on investment in additional fishing capacity, but also the prospect of negative returns. In many fisheries, additional investment in fishing fleets now contributes to overfishing and actually lowers the long-term catch.



World Fish Catch Per Capita, 1950-74

Rich and poor countries alike will suffer if oceanic fisheries collapse. Population pressures on limited agricultural land long ago forced the Japanese to turn to the oceans for their animal protein, and to develop a fish and rice diet. As a result, annual per capita fish consumption in Japan now exceeds 70 pounds in edible weight, the highest of any major country. The Soviet Union, frustrated in its effort

to expand livestock production, turned to the oceans for protein in a major way two decades ago.

More recently, low income countries with rapidly growing populations have also begun to look to the sea for protein. South Korea, India, Ecuador, and Peru now compete vigorously for a share of the catch in many fisheries, including the rich areas off their own coasts. Ecuador in particular has fined or confiscated many foreign vessels fishing within its 200-mile territorial limits.

Peru has been a leader in developing domestic fishing industries for badly needed foreign exchange. Beginning in the late fifties, its fishing industry underwent spectacular expansion. By the early sixties, Peru had emerged as the world's leading fishing nation, with its vast anchovy fishery accounting for one-fifth of the total world fish catch. For some years Peru has exported the bulk of the anchovy catch, supplying two-thirds of world fishmeal exports, a key protein source for poultry and livestock feeds in the industrialized countries.

In retrospect, it appears that the very heavy annual catches, ranging from 10-12 million tons in the late sixties and early seventies, exceeded the regenerative capacity of the anchovy fishery. The combination of overfishing and a shift in ocean currents during 1972 and most of 1973 caused the anchovies to disappear from traditional offshore fishing areas. Clearly, future fishing efforts will have to remain safely within the estimated 9.5 million ton maximum sustainable yield, regardless of rising world demand. (See Figure.)

The Northwest Atlantic Fishery serves as another prime example of what happens when demand exceeds the regenerative capacity of commercially sought species. Its 350-year history makes it one of the world's oldest oceanic fisheries and perhaps a bellwether of other fisheries. The catch of this biologically rich region increased steadily until 1968, when it reached 4.6 million tons. Since then, the catch has fluctuated at lower levels, and it fell to 4.0 million tons in 1975, a 13 percent drop from the 1968 level. This decline occurred despite heavy investments aimed at expanding the fishing fleets of several countries.

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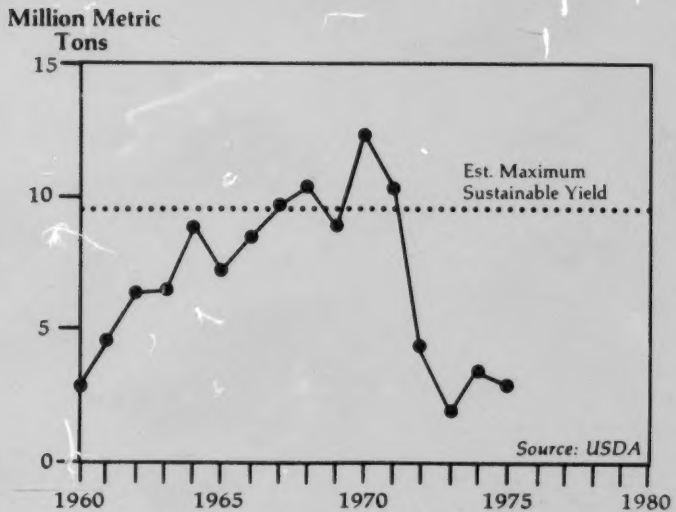


Peruvian Anchovy Catch, 1960-75

Catches of cod, halibut, and herring peaked in 1968 but have all since dropped substantially, with declines ranging from about 40 percent for herring to over 90 percent for halibut. Since effort during this period never flagged, this decline very likely resulted from overfishing. As marine protein supplies lag behind the global growth in demand generated by expanding population and affluence, additional pressure will of necessity be shifted to land-based protein resources.

The years ahead will likely witness a continuously widening gap between population growth and the sustainable yield of oceanic fisheries. Should this occur, the impact on prices and nutrition will be felt everywhere. In an over-populated and protein-hungry world, competition among countries for the limited and in some cases dwindling catch can only intensify.

Ski slopes, golf courses, beaches, city parks, wildlife preserves, and campgrounds are all utilized by increasing numbers of people each year. Access to what some view as a public resource has become an increasingly sensitive issue as rising population pressure combines with higher incomes to create a demand for more recreation facilities. City dwellers stream out in ever-increasing numbers to seek the therapy of nature. But what they all too often find is the same congestion they left behind—bumper-to-bumper traffic, noise, air pollution, and crowded, overflowing recreation areas. The impossibility of leaving behind the problems of the city plagues affluent and underdeveloped countries alike.

In Japan, the construction industry cannot keep pace with the growth in the number of golf enthusiasts clamoring for more golf courses. Limited land resources have forced a moratorium on further golf-course construction. The number of Japanese golfers is double the number that can be accommodated domestically—a situation that has led to the controversial purchase of U.S. and Latin American country clubs by Japanese business enterprises, for use by Japanese employees and tourists. In the ever-stiffening competition for access to recreation areas, local residents are losing out to well-heeled foreigners. In the poor countries, this phenomenon is particularly acute.

The Canary Islands have practically become a German tourist territory, while Gambia is thronged by Swedes. International hotels are springing up in isolated places like Machu Picchu, the lost city of the Incas. A real estate firm has begun selling off some of the world's few remaining uninhabited islands through advertisements in London newspapers. So many trekkers have come to the Himalayas that they are exacerbating the firewood shortage as well as littering the lower slopes of the mountains with discarded gear. The growth of luxurious tourist hotels near Mount Everest has required the installation of special landing strips and water systems, both jeopardizing a fragile environment.

16 More areas were deleted in 1975 from the U.N. list of National Parks and equivalent reserves for failure to meet standards of protection than were established in 1974. In Africa, parks and game preserves have been sacrificed to the fierce demand for farmland, which is needed to feed burgeoning populations. Elephant herds are shrinking as their foraging areas are plowed under. Findings recently released on land-use pressures along Serengeti Park's western border indicate that the human population there, already at a density of hundreds of persons to a square mile in several places, is growing at 4 percent per year.

Unfortunately, many poor countries have only recently begun to set aside recreation areas and natural preserves. Worse yet, by the time they have the necessary financial and administrative backing, local populations or affluent foreign tourists may have destroyed or commandeered any natural areas worth preserving. This process of degradation affects many of the world's more desirable recreational areas.

In the most popular U.S. national forests and parks, rangers have become more like policemen than nature guides, campgrounds are tent cities, and supermarkets sprout up in the woods. The "pleasuring-ground" envisioned by the founders of the National Park Service is sagging under the weight of more than 200 million visitors a year. Summer attendance in 1975 was up 14 percent from the previous summer. Unique American treasures in 38 national parks are being eroded by the people-crush. Campgrounds are often filled by 10 a.m. and facilities are jammed.

As campsites and cabins proliferate, more water treatment, sewage disposal, and garbage disposal facilities are needed, as well as more roads, more employees, and more policing. Campers and trailers clog the existing roads and, collected together in campsites, they can make pine-clad hills look like aluminum shantytowns. Human traffic now endangers the plant and animal life that parks were designed to pro-

"In Africa, parks and game preserves have been sacrificed to the fierce demand for farmland, which is needed to feed burgeoning populations."

tect. With a record 240 million visits to national parks in 1975, the National Park Service was forced in various situations to require permits for backpacking, to ban the collection of firewood, to prohibit autos, and to discourage large groups like Boy Scout troops from camping together. Such pressures alter the way people can hike, camp, and sightsee, but the increasing restrictions are essential if the natural conditions are to be maintained.

One direction in which the parks may be moving is reflected in a current study at Yellowstone on the feasibility of requiring reservations just to gain admittance to the park. The Yosemite master plan reveals another National Park trend—virtual elimination of the automobile. Some feel that parks should be intermittently closed for a year —as they are in Canada—just to let the fragile environment rest a bit.

How many visitors can be admitted to a wilderness area during a given period without altering its unique solitude, tranquility, and natural beauty? How large a multitude can be accommodated at a national park or game preserve before it is eroded in quality, if not irretrievably altered, or lost through intensity of use? These are questions that those who formulate population policy must consider.

18 . . . and Pollution

The absorption of waste is an important natural function of the earth's ecosystem. In the complex web of plant and animal life, what is waste for some organisms is sustenance for others. Only when waste increases to the point where the ecosystem can no longer readily break it down and absorb it does it become pollution. At this point waste begins to affect human health, climate, food production, and the survival of various forms of life itself. Public awareness of the pollution threat is rising, but the ultimate cost of coping with pollution, or of failing to cope with it, is not well understood.

As the human population has increased in numbers and become more concentrated, its potential for disrupting the earth's ecosystem has grown. Each additional person, especially in affluent societies, increases the burden on what is, in many areas, an already overburdened environment. An OECD study of air pollution in Swedish cities demonstrates the link between population density and air pollution. The concentration of sulfur dioxide in the cities' air, the result of burning fossil fuels in cars, generating plants, and industry, was highest in cities with the largest populations.

Synthetic compounds introduced into the ecosystem in recent years have proven particularly disruptive. Chlorinated hydrocarbons and radioactive wastes are not biodegradable. Once created, they remain in the environment over long periods of time, a continuing threat to animal and plant life.

Increased food production often aggravates water pollution problems. Runoff of animal waste from feedlots, the build-up of chemical fertilizer in water supplies, and the use of toxic, persistent pesticides concern health officials. Efforts to expand petroleum supplies pose new environmental problems from the tundra of Alaska to the North Sea. Oil spills on a scale that would dwarf the *Torrey Canyon* episode are a growing possibility.

Human pollution can be either chemical or biological. The burden of chemical pollution has been felt in the Baltic Sea and Lake Superior. In an effort to improve the water quality of the Ruhr River, in the Federal Republic of Germany, a neighboring river, the Emscher, has been officially sanctioned as a dumping ground for untreated industrial waste. In Minamata Bay, Japan, the release of industrial waste mercury into fishing waters has led to several thousand cases of mind-numbing, limb-twisting debilitation, now called Minamata disease.

Biological pollution is often the product of human population density. Human organic waste accumulates as population increases. With no easy way to dispose of the swelling volume of waste, city water supplies can become contaminated. Less than a tenth of the villages of India have access to clean drinking water. The water system in Mandalay, Burma, was judged unsafe in 1957, and although Mandalay's population has since quadrupled, no improvements have been made.

Pollution problems, once local in scope, are becoming global. Chemical waste pollutants, which do not break down quickly, ultimately reach the oceans. Big cities everywhere use the oceans as a common sink for garbage and industrial wastes. Airborne pollutants return to the earth with the rains and find their way to the oceans.

The Mediterranean Sea now serves as a sewer for over 400 million people. Although its ecological balance had never been seriously jeopardized until the mid-twentieth century, over-population, the tourist boom, industrial development, and maritime irresponsibility now threaten to turn the Mediterranean into a dead sea. Ever larger bodies of water are being saturated with waste. In the words of Thor Hyerdahl, "We begin to realize that the ocean has something in common with all other bodies of water: it is vulnerable."

Air pollution is causing increased rainfall and temperature changes over urban areas. The profusion of chemicals in the ecosystem en-

dangers the existence of a growing number of animal and plant species. Workplace pollutants—arsenic, asbestos, polyvinyl chloride, and others—are carcinogenic agents. Water-borne disease from organic waste may be the main cause of illness among the world's poor. Air pollution causes an estimated $25 million worth of agricultural damage in California.

Until recently nature was able to cope with the pollution generated by the human species. Only in the last generation or so, when both world population and industrial output have soared, has widespread, persistent contamination of the biosphere become a serious problem. As long as human numbers continue to grow, generating new demand for food, other goods, and services, many pollution problems will worsen, despite the most stringent efforts to bring them under control.

During the seventies, inflation has reached double-digit levels worldwide for the first time, creating extreme anxiety among national political leaders who must try to cope with it. The economists whose advice they seek are puzzled by the failure of all traditional inflation controls short of the sanction of wide-scale unemployment. What few seem to realize is that an important new source of inflationary pressure has emerged.

Inflation results when demand exceeds supply. Monetary and fiscal policies can be used to encourage an unhealthy growth in demand, one that outstrips the growth in supply. Inflation arising from such excessive demand can be controlled by adjusting these policies. In an economy dominated by large corporations and organized labor, inflation can also be of a cost-push nature. Escalating prices lead to demands for higher wages which in turn lead to still higher prices. Inflation also results when supply is temporarily restricted or disrupted by war, labor strikes, or weather.

Such restrictions of supply cause temporary inflation, but during the seventies a new source of long-term inflation has begun to emerge. World demand for goods and services has expanded at about 4 percent per year from 1950 to 1975, nearly tripling during this 25 year span. About half of all production gains were absorbed by population growth, which averaged close to 2 percent per year during this period, and about half by increases in per capita consumption. Meanwhile, it has become increasingly difficult, for a combination of economic and political reasons, to expand the supply of many strategic goods commensurately. The result has been scarcity-induced inflation. The impact of these conditions on the price and availability of such essential resources as food and energy has become dramatically evident during the seventies.

Prices of petroleum, firewood, cereals, soybeans, and fish have soared since the sixties; and they have affected the entire world.

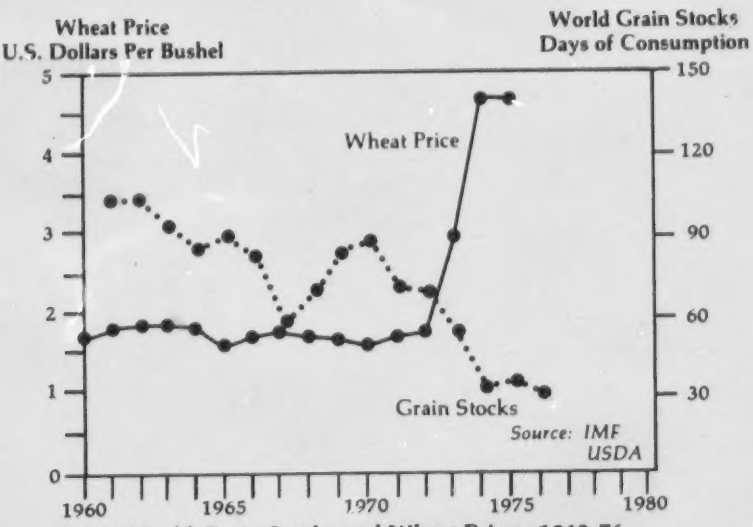
Underlying the escalation of petroleum prices was the realization that the world's petroleum supplies were dwindling and that their value was accordingly far greater than historical price levels indicated. Exportable supplies also happened to be concentrated in the hands of relatively few countries. Recognition of these factors created a psychological climate that enabled the Organization of Petroleum Exporting Countries to quadruple the price of crude oil.

Rises in firewood prices, while less visible internationally, have been only slightly less sobering. Firewood was a cheap, abundant source of energy when villages were small. As village populations grew, forests receded. Now wood prices are a primary topic of conversation among the poor from the Himalayas to the Andes. Price increases of two or threefold over the past few years are commonplace. Today the average manual laborer's family in some West African cities spends nearly one-fourth of its income on firewood.

As world demand for cereals, spurred largely by population growth, has outstripped the capacity of farmers to expand supply during the seventies, world grain stocks have been drawn down to a precariously low level. In 1976 they represented scarcely 30 days of world consumption, little more than pipeline supplies. Once stocks drop below about 60 days of supply, a psychology of scarcity begins to prevail and prices of major cereals climb rapidly. (See Figure.) At the low stock levels of 1974 and 1975, wheat prices doubled, affecting imports and consumption.

The price of soybeans more than doubled, not because growth in demand accelerated, but rather because of the difficulty of continuing the rapid expansion of supply. With most of the idled U.S. cropland already returned to use, and without a breakthrough in attempts to raise per acre soybean yields, the world confronts the prospect that soybeans will no longer be available at traditional prices.

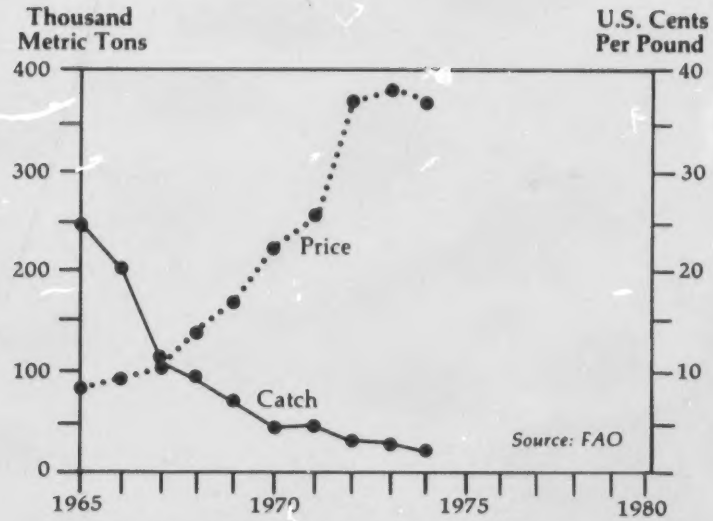
The world's fishermen have been even more strapped than its farmers. The catch, which had been expanding at an impressive 5 percent yearly from 1950, suddenly began to decline in 1971. Along with the difficulty of expanding supplies of soybeans, the poor catch helped convert the world protein market from a buyer's to a seller's market.



World Grain Stocks and Wheat Prices, 1960-76

The haddock fishery in the Northwest Atlantic illustrates how mushrooming demand can eventually overtax a reserve. Haddock were heavily fished until the early sixties, when the regenerative capacity of the fishery was pressed beyond its natural limits. Then, the catch fell from 249,000 tons to 23,000 tons, and haddock prices climbed fourfold in eight years. (See Figure.) Unfortunately, the inverse relation of catch size to price is not unique to the haddock market.

The rising cost curves associated with efforts to expand the supply of many essential resources threaten human well-being everywhere. World oil reserves are being rapidly depleted and no alternative sources of energy are readily available at the energy prices of the past. The rising cost of producing energy is only too real and it imperils world food supplies, dependent as they are on petroleum and petroleum-based fertilizers. In agriculture, farmers in industrial societies face diminishing returns on the use of fertilizer and energy, while in many poor countries new land coming under cultivation—where any is left—is of low fertility, resulting in higher food production costs.



Haddock: World Catch and U.S. Price, 1965-74

Those who suffer most under the burden of scarcity-induced inflation are the poor, whether in the *barriadas* of Lima or the slums of Naples. Worsening inflation means that those living at subsistence level find themselves increasingly unable to make ends meet. When the price of grain triples, families that already spend 60 percent of their income on food can only eat less.

With four billion consumers already on the scene and 200,000 more being added each day, scarcity-induced inflationary pressures may grow chronic. Indeed, inflation poses one of the most difficult challenges that political leaders will face in the years ahead. What they must now realize is that, without a marked slowdown in population growth, inflation simply may not be manageable.

"In the United States, cancer is now the leading cause of death from disease among children under fifteen years of age."

. . . and Environmental Illnesses

A growing share of all illness and death in the world today is directly attributable to human changes in the environment. These changes stem from new technologies, population growth, and the need to produce ever more goods and services to satisfy human needs. Among the illnesses linked to environmental alteration are emphysema, stroke, parasitic infections, heart disease, and cancer.

The spreading incidence of environmental illness is largely attributable to the introduction of new chemicals into the ecosystem, increased levels of air and water pollution, and crowding. The burning of fossil fuels in cities and the spreading use of chemicals and pesticides in agriculture, for example, lead to numerous health problems.

Environmentally induced illnesses take many forms. Horrifying but egalitarian, they spare none; the rich and poor alike are potential victims. No respecter of age, sex, or social status, cancer now ranks as one of the most feared killers in industrial societies. In the United States, it is now the leading cause of death from disease among children under fifteen years of age. It accounts for a fifth of all deaths in the United States.

Schistosomiasis is a debilitating, water-based parasitic illness present in 71 countries. It affects a population equal to that of the United States. Described as "the greatest plague in the world" by the U.S. Public Health Service, it is spread by microscopic parasites carried by snails that thrive in irrigation water polluted by human waste. Farmers and children who work and play in the water for hours at a time pick up the parasite, which permanently damages their bladders and livers. To meet burgeoning food needs, governments in many regions are damming rivers and expanding irrigation facilities, despite the certainty that schistosomiasis will spread. The disease, which shortens the lives of its victims, is almost incurable. In many nations it is already epidemic. In Egypt, at least 15 million people, two of every five persons, are infected with the parasite.

26 As population density grows, health problems often intensify. One of the most noticeable effects of high birth rates in developing countries has been the rapid growth of cities. With city life come city illnesses. More and more people concentrated in urban areas generate ever greater amounts of pollution, overwhelming human and natural efforts to clean the air and water.

Air pollution and the diseases it causes are increasingly prevalent in some cities. Dust, sulfur dioxide, and other by-products of the burning of fossil fuels have been directly linked to illness and death. A recent study conducted in Nashville, Tennessee, showed that the incidence of heart disease in polluted areas was nearly double the normal rate. A similar study of non-cigaret smokers in California indicated that men who live in cities die of lung cancer over three times as often as their counterparts in relatively unpolluted rural areas.

Today, a haze from the burning of heating and industrial fuels, low-grade coal, and wood hangs over cities from Seoul to Mexico City. Unfortunately, any hope that these rapidly growing areas could change over to cleaner energy sources and improve their air quality, as many cities in affluent countries have done, has been stifled by recent oil price increases. With many cities in poor countries expected to double in size in little over a decade, the number of individuals afflicted with emphysema, chronic bronchitis, and lung cancer will rise in tragic symmetry.

The shrinking availability of clean, safe water is also of increasing concern to health officials in rich and poor countries. The expansion of sewage treatment and water purification systems has not kept pace with the profusion of industrial, agricultural, and human wastes generated by rapidly growing populations. Human organic waste, often a carrier of parasites and numerous contagious diseases, increases in direct proportion to human numbers. In areas of high population concentration, growing pressure on water resources has helped set the stage for outbreaks of cholera, typhoid, and hepatitis. Two-thirds of

"The effects of increased exposure to cancer-causing chemicals may not show up in death statistics for 20 years."

the population in the poor countries lack access to safe water, and the construction of pure water services lags behind the growth in demand.

The expanding demand for water over the past two decades has meant that communities must use and reuse the same supply. The residue from agricultural and industrial use often accumulates and harms human health. This problem was highlighted in late 1974 when the U.S. Government's Environmental Protection Agency reported finding traces of several known cancer-causing agents in the New Orleans water supply, ostensibly introduced during industrial use of the same water upstream. Some analysts feel that these carcinogens might be responsible for hundreds of deaths in New Orleans over the past few years.

The final story on environmental illnesses has yet to be written. The effects of increased exposure to carcinogenic chemicals may not show up in death statistics for 20 years. A U.S. National Academy of Sciences report suggests that, as a result of this delay, serious environmental hazards could go undetected for many years and then appear in mortality statistics with dramatic suddenness.

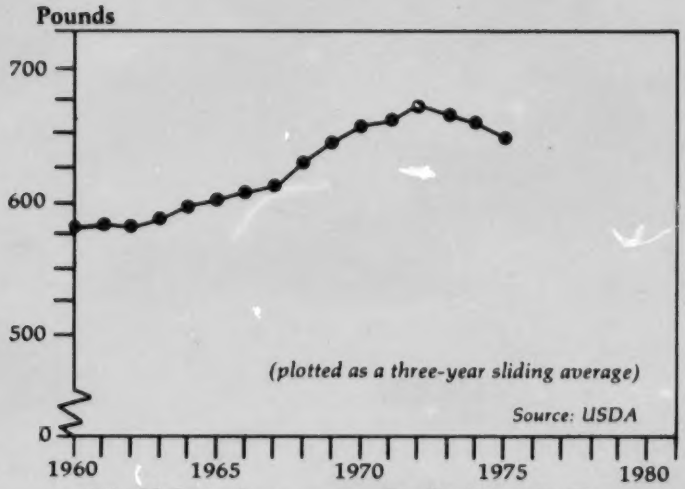
In many areas of the world, continued population growth is contributing to the growing incidence of environmental illnesses. When coupled with stringent new pollution controls, and massive efforts to improve water supplies, sanitation, and housing in poor countries, curbing population growth could markedly improve human health.

The world begins the last quarter of this century confronted with three interrelated and worrisome developments on the food front. These are the recent downturn in per capita grain consumption, the inability to rebuild depleted grain reserves, and the accelerating world dependence on North American grain exports. Meanwhile, world population continues to rise by nearly 70 million per year.

From 1950 until the early seventies, the amount of food produced per person in the world edged upward in a steady, encouraging fashion. Consumers and governments around the world had reason to feel optimistic about nutritional progress as per capita consumption of grain moved from an annual average of 583 pounds in 1960 to 681 pounds in 1973. But since that high point, the annual averages have fallen by about 35 pounds: population has been increasing more rapidly than food production. (See Figure.) In those areas where consumption was just beginning to meet minimum nutritional requirements, this reversal has been a crushing blow. Because food is primarily apportioned through purchasing power, a disproportionate share of the reduction has been forced upon the world's poor.

Today, experts are hard-pressed to decide whether this historic reversal marks a temporary interlude between periods of rising per capita food consumption, the leveling off of the nutrition improvement trend, or worse yet, the beginning of a downward trend.

Several factors have contributed to this disappointing decline in the world's per capita grain consumption. Production has been restricted by the high cost and tight supply of energy; the high cost and tight supply of fertilizer; and, where firewood is scarce, the increasing use of dung for fuel instead of fertilizer. In areas where shifting cultivation is practiced, grain production has also been constrained by the shortening of the fallow cycle and prevention of soil regeneration—a result of rising population pressure.



World Grain Consumption Per Capita, 1960-75

29

Grain reserves, an index of world food security, have been severely depleted. In 1961 the combination of reserve stocks of grain and cropland idled under U.S. farm programs amounted to the equivalent of 105 days of world grain consumption. By 1972 stocks equaled only 69 days of world consumption. Although all of the 50 million acres of idled U.S. cropland had been brought back into production, stocks continued to decline. The 1976 carryover stocks equal only 31 days of consumption. All hopes of soon rebuilding them vanished with the Soviet's poor 1975 harvest.

While reserves have been falling, dependence on North America has increased. Over the past quarter century the region has emerged as the breadbasket for a world of food-deficit countries. During the seventies this trend is accelerating. A measure of growing worldwide food deficits, grain exports from North America have nearly doubled

30 since 1970, expanding from 56 million tons in 1970 to nearly 100 million tons during fiscal year 1976. All but a few of the 115 countries for which data are readily available now import grain, and the worldwide movement of countries outside of North America from export to import status is a one-way street. Literally scores of countries have become important food importers, but not one new country has emerged as a significant cereal exporter during this period.

The dominant single factor reshaping world food-trade patterns in recent decades is the difference in continental rates of population growth. A comparison of North America and Latin America, two regions roughly equal in size and resources, illustrates the devastating role of rapid population growth. As recently as 1950, both North America and Latin America had essentially the same population size, 163 and 168 million respectively. But the difference since then explains why North America emerged as the world's breadbasket while Latin America became a net food importer. While North America's population growth has slowed substantially since the late fifties, that of many Latin American countries has expanded at an explosive 3 percent or more yearly. If North America's 1950 population had expanded at 3 percent per year, it would now be 341 million rather than the actual 236 million. Those additional 105 million people would absorb virtually all the current exportable surpluses, and North America would be struggling to maintain self-sufficiency.

Aside from the overly rapid growth in demand, production problems abound. The conditions under which the world's farmers and fishermen will attempt to expand food output during the final quarter of this century are apt to be far less auspicious than those that prevailed during most of the quarter century just ending. None of the basic resources required to expand food output—land, water, energy, fertilizer—can be considered abundant today. In some countries, the area under cultivation is actually declining as a result of population-induced phenomena like desert encroachment, soil erosion, or urban sprawl. As a result, food production has lagged behind demand in virtually every geographic region except North America.

The consequences of these developments are both global and serious. Upward pressure on food prices affects poor people everywhere. As countries jockey for access to limited grain supplies, the global politics of food scarcity promises to fan the embers of discord and distrust.

Reports in 1974 of rising rates of nutrition-related deaths in several poor countries underscore the need for closer attention to food and population issues. Widespread deficiency-related diseases are sapping the vitality of hundreds of millions, reducing their productivity, alertness, and endurance. Pre-natal and infant malnutrition are causing brain damage and retardation in children. Today's malnutrition is shackling tomorrow's generation of adults, injecting a new and unsavory element into development planning.

Retardation is only one of malnutrition's threats. In Ecuador, child deaths ostensibly due to measles are more than 300 times more frequent than in North America. Whooping cough is still a major killer in much of the world. Each year more than 15 million children under five die of the combined effects of malnutrition and infection. Deaths in this age group, accounting for a quarter of all the deaths in the world, portray the interaction between population and hunger in its grimmest perspective.

32

Woe unto them that
join house to house,
that lay field to field,
till there be no place
that they may be placed
alone in the midst of the earth.

Isaiah 5:8

The flat-roofed, mud-walled dwellings of the Middle East, and the pitched-roof, stilt-supported bamboo houses of Southeast Asia illustrate the variety of housing styles that enrich the human heritage and form an essential part of the "quality of life." Behind this diversity and ingenuity, there is a universal reflection of basic family needs—space for sleeping, eating, child-rearing, and leisure.

Providing decent living quarters for rapidly increasing populations seems dishearteningly difficult today. Housing requires space, building materials, capital, and energy for fabrication. As a result of the swelling demand for houses, the land, lumber, cement, and fuel required have risen beyond the financial means of many of the world's four billion people. The expectation that a growing share of each nation's people would be able to enjoy a home of their own has now been dimmed considerably by the impact of rapid population growth and associated material scarcities.

Some countries have found themselves unable to provide even one-fifth of the new housing needed in the past decade. The task of housing the current generation, much less the one to follow, presents a monumental challenge, not only to the poor nations, but to the rich as well.

Substantial gaps in housing exist throughout the developing world. From one-third to two-thirds of the populations of six cities studied for the 1975 World Bank Housing Policy Paper were unable to afford the lowest-cost housing presently being produced: the exact percentages were 35 percent in Hong Kong; 47 percent in Bogota; 55

"A Leningrad playwright has captured in a popular drama the pathetic agonies of divorced couples forced to continue living together until they find other housing."

percent in Mexico City; and close to 65 percent in Madras, Ahmedabad, and Nairobi.

The poor of these cities, unable to afford the cheapest conventional dwellings, are pushed to ever more distant peripheries. Squatter camps and shantytowns built of cardboard and flattened kerosene cans thus become a permanent feature of almost every city in developing countries. The populations accommodated in such flimsy shelters are growing wildly, and may someday become the majority. 33

Inevitably even the basic amenities of life become unaffordable luxuries under such conditions. Those living in shacks of tin or cardboard have little or no access to services, schools, or sewers. Except for what the inhabitants fetch in pails or oil drums, or buy at high cost from peddlers, they don't even have water. Garbage piled around the shacks presents fire and health hazards. Parasites and contagious diseases spread under crowded, stifling conditions. The poor are bearing the burden of society's failure to bridle population growth.

The creation of shantytowns reinforces the cleavage between modernized and traditional sectors; political integration and economic integration both become more difficult. Conversely, progress in the housing sector is not only a key to development, but is also a vital element of the total modernization process. According to the World Bank Housing Paper, housing provides a needed focus for savings, representing up to 20 or 30 percent of fixed capital formation in some countries. In countries with substantial, underutilized labor and material, housing can make such resources productive at low cost. But rapid population growth reduces the accomplishments of technical and financial assistance programs in this sector to a pittance.

The financial dimensions of the housing problem provide the real clue to its difficult nature. A costly investment, housing absorbs sums amounting to several times an earner's average annual income—the multiple varies from three to ten or more in inverse ratio to the level of economic development. A study from India analyzing income levels, savings capacity, and capital housing costs concludes that 85 percent of Indian households cannot finance ownership of a hous-

ing unit. The situation is much the same in other parts of Asia, Africa, Latin America, and southern Europe.

34 The developed countries themselves should become more sensitive to housing needs as their own populations face housing shortages. For example, the United States has come full circle: in the 1920s only one family in five could afford to move to a home in the suburbs. In the 1950s the dream of a house of one's own amidst some greenery was within the reach of more than half of all American families, and suburbia expanded dramatically. Today, once again, only one family in five can afford a non-subsidized house. Millions of American families are in need of housing assistance, and the problem promises to worsen.

Some industrial countries have not even been able to accommodate the housing needs of past population growth or immigration. In London, nearly 30,000 squatters, relying on a vague law that dates to Richard II and the Black Death, are occupying without formal consent thousands of private dwellings, some forlorn and crumbling, others awaiting new tenants or vacated by families on holiday. The squatters contend that the housing shortage, rising rents, and inflation have left them no other recourse, since 200,000 London families are already on waiting lists for housing in public projects. In some cases, public housing officials hold lotteries among applicants for the limited units available.

The Soviet Union, which has increased in population by 77 million since 1950, also has a housing shortage: people wait for years to get an apartment, and small family size is often attributed to space constraints. Soviet writers blame the housing squeeze for the Russian divorce rate, which is among the world's highest. A Leningrad playwright has captured in a popular drama the pathetic agonies of divorced couples forced to continue living together until they find other housing. Though part of the problem stems from the low government priority accorded housing, much is also attributable to the effort of keeping up with population growth and urbanization. Yet as bad as these conditions in the industrial countries may seem, the housing problem now beginning to unfold in the less developed nations is much, much worse.

. . . and Climate Change

35

"There can be little doubt that man, in the process of reshaping his environment, has changed the climate of large regions of the earth." So reports a study of inadvertent climate modification by the Massachusetts Institute of Technology. The impact of these climatic changes is far-reaching, affecting human health, living patterns, and food production. As more and more people populate the earth, human numbers and activities threaten to alter the climatic patterns to which mankind has grown accustomed.

The increase of carbon dioxide in the atmosphere caused by burning wood and fossil fuels, dust in the air caused by urban and agricultural pollution, and thermal pollution—the result of the waste heat from economic activity—all affect local rainfall and temperature patterns.

Airborne dust is probably the most common and easily recognized of the man-made pollutants that affect climate. City rains that leave dark blotches on clothes are evidence of extremely dirty, dust-filled air.

Humans generate airborne dust in every daily activity from suburban driving to tilling the soil. Around large cities, where millions of individual actions each generate their own small quantity of dust, the particles often act as cloud seeders, increasing rainfall. In a study of the St. Louis metropolitan region, a group of researchers from the University of Illinois found rainfall as much as 30 percent higher in Edwardsville, Illinois, downwind of St. Louis and the Alton-Wood River industrial area, than in surrounding areas.

Periods of global cooling have been recorded over the past two centuries after major volcanic eruptions spewed tons of dust particles into the air. Meteorologist Helmut Landsberg estimates that, along with world population, the amount of dust in the atmosphere has doubled since the 1930s, despite the absence of major volcanic eruptions. Some scientists fear that increased amounts of atmospheric dust may act as insulation, reflecting the sun's rays away from the

earth and lowering temperatures. While it is too soon to assess the global climatic significance of Landsberg's estimates, studies of the glaciers indicate that high concentrations of dust in the air were associated with the onset of the last ice age.

While rising atmospheric dust levels may be cooling the earth, another pollutant, carbon dioxide, appears to be exerting a warming influence through the so-called "greenhouse effect," which slows the release of the earth's heat into space. According to the best estimates, carbon dioxide levels have increased 10-15 percent since the beginning of this century. Carbon dioxide forms as coal, oil, wood, and gas are burned. As the human population grows larger and more affluent, more fuel is burned and more waste products are created.

This warming effect is supplemented, in urban and industrial areas, by thermal pollution or waste heat. While small compared to the heat the earth receives from the sun, waste heat around large cities can markedly alter local climates. Urban areas average several degrees warmer and have less snowfall and more rain than adjacent rural areas. In Washington, D.C., the frostfree growing season for backyard gardeners is now one month longer than in outlying areas. The urban heat island created by the city of Paris causes temperatures to average higher at the center of town than at Le Bourget airport on the outskirts of the city, meaning more fog and rain for Parisians.

In rural areas, human activity affects local climate. Population growth expands villages and intensifies the demand for food. Attendant deforestation, overgrazing, and overcropping change temperature patterns and the humidity balance. Meteorologists Reid Bryson and David Baerreis of the University of Wisconsin report that the atmospheric dust generated by this human abuse of the land may be altering the monsoon patterns over northwestern India and part of Pakistan.

As population pressures increase, desire for more rainfall to improve agricultural production intensifies; accordingly, the weather is intentionally modified to suit human needs. The seeding of rain clouds, a means of bringing rainfall to dry areas, has become an expedient

"Cloud-seeding often does no more than cause rain to fall in one place at the expense of another, a potential source of international tension."

response to short-term drought situations. Unfortunately, cloud-seeding often does no more than cause rain to fall in one place at the expense of another, and thus presents still another potential source of international tension.

Weather patterns have always been in flux. Though this generation generally accepts the climate of the last quarter century as normal, it was in fact a time of unusually favorable temperature and rainfall in key food producing regions. It thus permitted unprecedented population expansion.

A recent study by the United States National Academy of Sciences concludes that "the rapidity with which human impacts on climate threaten to grow in the future is a matter of concern." Recent cooling trends in the United Kingdom have shortened the growing season by nine days since 1940. A similar shortening of the growing season or a change in rainfall patterns in the American wheat and corn regions could easily upset the earth's already precarious food-people balance.

The impact of the world's four billion people on climate can already be measured locally wherever population density is great. Even more worrisome, local changes may also be triggering shifts in global climatic patterns and trends. Unfortunately, the impact of man's activities on the world's weather is not yet fully understood. A growing population generates increasing amounts of carbon dioxide, airborne dust, and thermal pollution. It fuels an expanding demand for food that may soon be the justification for attempts by hard-pressed countries to tamper with their climate. These unforseen and often abrupt climatic changes add yet another element of uncertainty to an already uncertain future.

When human population in the poor countries grows, the livestock population is almost always increased commensurately in order to expand draft power, food supplies, or family wealth and security. As herds of cattle multiply, they can denude the countryside of its natural grass cover, particularly if they are not properly controlled. Overgrazing by goats causes even more damage because it affects trees and shrubs as well.

Combined with spreading deforestation, overgrazing is producing serious denudation of the countryside in some poor countries, facilitating the rapid spread of soil erosion and land abandonment. Literally millions of acres of the world's cropland, mostly in food-deficit areas of Asia, the Middle East, Africa, and the Andean countries, are abandoned each year because severe soil erosion has so lowered productivity that the land cannot sustain local inhabitants using existing agricultural technologies. An inch of topsoil takes centuries to form through natural processes, but it can be destroyed in only a fraction of that time through mismanagement.

History provides us with graphic examples of human abuse of the soil. North Africa, once the fertile granary of the Roman Empire, is now largely barren and unproductive. The Fertile Crescent of the Tigris-Euphrates Valley may have supported more people in the pre-Christian era than it is able to support today. In North America, the Chihuahuan Desert in New Mexico and the Sonoran Desert in Arizona are now believed by some analysts to have been expanded by overgrazing in the few hundred years since the arrival of Europeans.

Many of the world's densely populated regions—such as western India, Pakistan, Nepal, northern China, North Africa, the Middle East, and the Andean regions of South America—face similarly severe overgrazing and subsequent erosion of their soils by wind and water. Over the past thirty-five years, human and livestock populations along the sub-Saharan fringe have multiplied rapidly, nearly dou-

bling in some areas. Populations in Mali, Niger, the Sudan, and Ethiopia are increasing by 3 percent yearly. The results are overgrazing and deforestation, which encourage the advancement of the Sahara Desert along parts of its southern fringe from Senegal to northern Ethiopia, and the degradation of land quality in a huge semi-arid zone to the south.

As human and livestock populations retreat before the expanding desert, these "ecological" refugees create even greater pressure on new fringe areas, exacerbate the processes of land degradation, and trigger a self-reinforcing negative cycle of overcrowding and overgrazing in successive areas. When the inevitable drought sets in, as one did in the early seventies, this deteriorating situation is brought to a disastrous climax—for the humans who perish by the hundreds of thousands, for livestock, which die in even greater numbers, and for productive land, which is destroyed.

If, as some meteorologists believe, the life-giving belt of monsoon rains is shifting southward, then ecological overstress and climatic changes are reinforcing each other with devastating effect. If the process of desertification is not reversed, Africa, which has the highest birth rate of all the continents, may lose a sizable share of its food-producing capacity. Meanwhile, the vastness of the Sahel and the delicate social problems involved in any attempts to alter the living habits of the proud nomadic inhabitants are formidable obstacles to progress.

While the southward movement of the Sahara has been making headlines in the early seventies, the desert has also been creeping northward toward the Mediterranean. While the population of arid North Africa has multiplied sixfold since the beginning of the century, the destruction of vegetation in Morocco, Algeria, Tunisia, and Libya has accelerated. Both trends have turned upward most sharply since about 1930. In addition to intense overgrazing, the extension of unsustainable grain farming and firewood gathering have all helped ravage the agricultural environment. According to the U.N. Food and Agriculture Organization, more than 250,000 acres of farm land in North Africa are lost to the desert each year.

40 With increasingly eroded lands in the northern mountains, and an encroaching desert to the south, food production has inevitably stagnated in many areas of North Africa. This one-time granary of the Roman Empire is now a major food-importing region. Soaring proceeds from petroleum and phosphate exports and the remitted earnings of the millions who have migrated to Europe to find work help to mask widespread rural deterioration in North Africa.

By no means limited to the Saharan fringes, overgrazing is a major problem in parts of southern Africa too, particularly in Botswana. Vast semi-arid grasslands in Kenya and Tanzania have been gravely damaged by overgrazing. Barren, desert-like environments created by centuries of overgrazing and wood gathering also cover huge areas of the Middle East from the Mediterranean coast of Lebanon to Afghanistan—areas that were once at least moderately vegetated. Some such lands would recover if the constant pressure of overgrazing, which is the norm in most Middle Eastern countries, were removed. But others have been permanently degraded by erosion and, in more extreme cases, dune formation.

India and Pakistan provide further striking examples of ecological overstress. As human and livestock populations have grown, the subcontinent has been increasingly overgrazed. Apart from intensively irrigated regions like the Nile and Indus Valleys, northwestern India is the world's most densely populated arid zone. The practical consequence of this population pressure has been the extension of cropping to submarginal lands fit only for forestry or range management, helping to make this perhaps the world's dustiest area. Meanwhile, as the land available for grazing shrinks, the number of grazing animals swells—a potent formula for overgrazing, soil erosion, and desertification.

The area available exclusively for grazing in western Rajasthan shrank from 13 million to 11 million hectares between 1951 and 1961, while the population of goats, sheep, and cattle jumped from 9.4 million to 14.4 million. The livestock population has grown

steadily since then. After several decades of chronic overgrazing, much of west and central India is barren and lifeless. The Thar Desert, which annually engulfs 13,000 hectares of land, now threatens the productivity of a semi-arid area covering more than a fifth of India, to the grave detriment of the large population now dependent on it.

Overgrazing is not new, but its scale and rate of acceleration are. Damage that formerly took place over centuries is now being compressed into years by the fateful arithmetic of population growth. Populations are, in effect, outgrowing the biological systems that sustain them.

. . . and Crowding

42 Aerial photographs of Java reveal that people are actually moving into the craters of occasionally active volcanoes in their search for land and living space. Periodic evacuations and loss of life result. In Bangladesh, people are driven by population pressure into flood-prone lowlands and onto low coastal islands previously uninhabited because of the danger of tidal waves and typhoons. The *New York Times* of November 15, 1970, reported more than 168,000 people killed by a tidal wave that swept the coastal area. Described as one of the worst natural disasters of the century, this loss of life is more accurately attributed to overcrowding than to any "natural" phenomenon.

The more people there are on earth, the more people there are per square mile. Nothing can change that fact. Four billion of us now live here, and each day there are more. Unless society dramatically reverses recent trends, much of this population will be packed into urban centers. If high population density has negative effects on behavior and health, humanity faces some trying times.

People live under crowded conditions without any real understanding of the social consequences. In Ghana, between 1948 and 1960, the average number of persons per dwelling rose by four in each of three major cities, up to 21 persons per dwelling in Kumasi. In Ghanaian towns with populations of from 5,000 to 50,000, one-fifth of the people lived twenty or more to a house. In the three towns with populations over 50,000, this proportion rose to 35.6 percent. Statistics for Algiers are even more alarming: even eliminating from the calculations the 30 percent of the population confined to shantytowns, an average of four people live in every room.

In Middle Eastern cities that have been inhabited for thousands of years, crowding has also reached acute proportions: plots of land originally consisting of single dwellings with gardens have been converted to multi-family dwellings, with the result that increased population density has overburdened schools, water supplies, recreational

"Laboratory experiments show that crowding has disastrous effects on rats, mice, rabbits, deer, and other animals."

facilities, and other amenities. Jordan, with an annual population growth rate of 3.5 percent, and Syria, with a 3.3 percent rate, are both plagued by these problems; they thus provide a fertile breeding ground for dissatisfaction and unrest in a politically fragile corner of the globe.

43

Although politicians, environmentalists, ethologists, and biologists constantly warn of the evils of high density living, asserting that crowding causes tension, anxiety, divorce, aggressiveness, family troubles, neurosis, and crime, little research has focused directly on the effects of crowding on humans. But extensive research has been done on how crowding affects animals, and the results suggest strongly that humans are adversely affected by high population density.

Laboratory experiments show that crowding has disastrous effects on rats, mice, rabbits, deer, and other animals. Dr. John Calhoun, in his pioneering research on rats at the U.S. National Institutes of Health, discovered that (even when food, temperature, disease, and other factors are optimal) high density and the subsequent disruption of nesting patterns produce an overall breakdown in normal social behavior. The presence of a large number of other animals acts as an intensifier of social interaction and of competition for resources. Under crowded conditions, most male rats cannot establish or defend a nest. Females cannot care for their young effectively, resulting in increased infant mortality. The incidence of aggressive attacks, rape, and deviant sexual behavior escalates. Social withdrawal, juvenile delinquency, disorientation, miscarriages, and abnormal births ensue.

Research indicates that arousal caused by living under the stressful conditions of high density and competition has specific adverse physiological effects, particularly on adrenal and gonadal activity. The adrenal gland grows larger as it grows more active. Increased adrenal activity is in turn associated with a general stepping up of an animal's internal physiological processes: the heart beats faster, and metabolism increases. If extreme enough, the animal lives in a state of perpetual excitement. Obviously, in the long run, the animal's gen-

eral health can only deteriorate. The same thing may be true for human beings suffering from stress. Psychologists have known for years that people under stress cannot easily perform complicated jobs, learn new material, or think creatively. It is now becoming clear that stress may actually shorten lives as it traumatizes and "wears down" body functions.

Canadian scientist Hans Selye, internationally famous for his research on stress, writes that "Anything . . . that speeds up the intensity of life causes an increase in stress. Exhaustion of adaptation energy through demands that are prolonged, too frequent or too intensive leads to 'distress,' a damaging form of stress." Crowding and its side-effects, competition and aggression, can induce stressful situations. This stress seems to be a major factor governing susceptibility to heart disease, high blood pressure, skin disorders, and stroke; behavioral problems like child abuse, alcoholism, and homicide also seem to be stress-related.

The toll of prolonged stress is visible not only in individuals who suffer premature and irreparable bodily wear and tear as well as functional disorders, but also in the social fabric. Sociologists, psychologists, and urban crime victims agree that, in crowded cities, traditional patterns of civil behavior are breaking down as a result of tension, crime and fear of crime, noise, hostility, turmoil, bustle, and brashness. Apart from the stress caused by crowding, Philip Zimbardo, a Stanford University psychologist, believes that New Yorkers' uncivil behavior stems from feelings of anonymity or "deindividuation," the feeling that "If no one knows who I am, what difference does it make what I do?" Stress transforms neighbors into enemies; it generates fear, insecurity in friendships, and rude behavior.

Apart from causing undesirable stress in animals and people, crowding may have other negative effects on human well-being. Research on the use of personal space (proxemics) demonstrates that people do respond to variations in the space around them and do have rules about what is appropriate and comfortable. Even Jonathan Freedman,

"People do respond to variations in the space around them and do have rules about what is appropriate and comfortable."

a scientist who believes that crowding is not necessarily bad, demonstrates in a book-length study that crowding intensifies an individual's typical reactions to a particular situation: given that much of mankind is not only crowded, but short of food, housing, and hope, any intensification of the natural human response to unpleasant situations could be dangerously explosive, to say the least.

Beyond this one can say that, under some circumstances, high density seems to make people competitive and aggressive. People seem to do their best to defend their property and space from incursions, whether the property be a home, a country, or even an adjacent empty seat on a bus. Similarly, anthropologist Jane Goodall has reported that, as man has encroached on the chimpanzee's jungle habitat, crowding the animals into an ever-smaller area, some of the once peaceful chimps have become savagely violent.

In the United States, the crime rate in the big cities is more than five times as great as in small cities, eight times as great as in the suburbs, and eleven times as great as in rural areas. Crimes, particularly major crimes, occur largely in highly-populated areas. Studies made in Honolulu in 1957 and 1966 found that high crime rates could be correlated to population density, even when income and educational level were controlled. With the mental and physical health of mankind hanging in the balance, it would be wise to limit further crowding until its possible ill effects are better understood.

. . . and Income

46

Development economists have traditionally been concerned with population growth because it partially offsets the gains of economic growth. During the sixties, when the developing countries as a group experienced an average annual economic growth rate of close to 5 percent, with population growth rates of 2 to 3 percent, half of the economic gain was absorbed by population growth, while the other half raised per capita incomes.

While the belief that population growth can undermine efforts to upgrade living standards has always been a legitimate one, it is gaining importance. With the perceptible economic slowdown that has occurred in most of the world during the seventies, population growth may offset all economic growth in some countries, actually preventing rather than just reducing any gains in per capita income.

During the postwar period, people everywhere came to expect that the future would be brighter than the present. The strength of rising expectations and the resentment that springs from their frustration are realities with which governments have to reckon, regardless of their position on the political spectrum. In the early sixties, Premier Fidel Castro of Cuba used to say that by 1980 every Cuban family would own a house, an automobile or motorcycle, and a large refrigerator full of the most varied, country-grown foodstuffs. Even the "campesinos," he once declared, would till the land in tractors equipped with air-conditioned cabins, working only a few hours a day. Such promises are no longer made in Cuba, where a marked slowdown in development has occurred. From 1975 to 1980 the government projects an annual growth rate of 6 percent, much lower than the 10 percent rate it claimed for 1970-75.

The projected slowdown in growth cuts across ideological boundaries. Brazil, after years of heady growth at 9 percent annually, is lowering its economic sights as the economy struggles with the high cost of energy and a swollen external debt. The economy of South Korea, which has grown at a yearly average of 10 percent over the past dec-

ade, is expected by the Bank of Korea to expand at only 4 percent annually for the next five years. While rapid growth economies such as South Korea, Brazil, and Cuba are lowering their sights, less robust national economies find themselves in exceedingly difficult straits.

The prospect of slower increments in living standards, or even declines in some countries, is not just a remote possibility. In India, real income per person declined from $45 per year in 1972 to $41 in 1973, a decline of nearly 10 percent. In Bangladesh the downward spiral is further advanced, and is compounded by the new malady of political instability. Despite a bumper rice harvest in 1975, the average Bangladeshi was consuming less rice than he was 15 years ago. The number of new mouths to be fed has simply exceeded the capacity of the country's farmers to expand their output. As one foreign aid expert has described it: "Bangladesh is a look at the future. It is now what some other countries in this part of the world might become."

The battle between population growth and efforts to raise or maintain living standards is not confined to the poor countries. Economic expansion has slowed visibly in almost all of the industrialized countries, including Japan, the Soviet Union, the United States, Germany, France, and others. The economic predicaments besetting the Soviet Union and Eastern Europe are reflected in their development plans for the next five-year period, which include substantially lower growth targets as well as the reduction of capital investments from past levels. From 1965 through 1973, the combined economic growth rate of 24 major industrial nations averaged nearly 5 percent a year. A steep descent from the 1973 peak brought this combined rate to zero in 1974 and below zero in 1975. The result, given the population growth during the interim, was a drastic decline in per capita income and consumption. (See Figure.)

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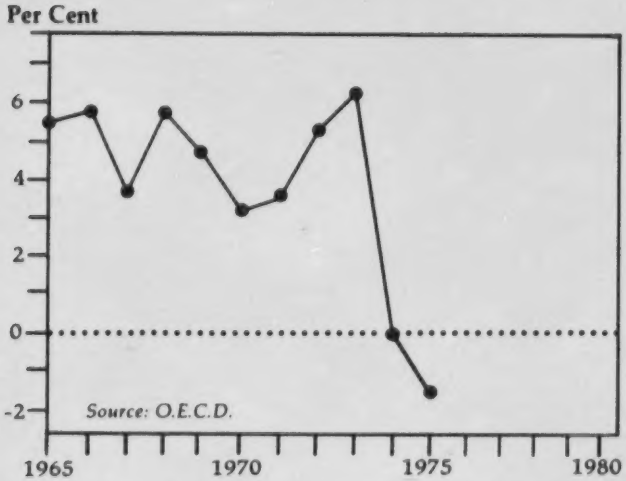

Combined GNP Growth Rate of 24 Industrial Nations 1965-75, (weighted average)

More Americans were living below the official poverty level in 1975 than were five years earlier. More people are currently unemployed in the industrial countries than at any time in the last forty years. Though the 1974-75 recession was temporary, contributory factors such as inflationary pressures remain, leading economic analysts and planners to lower their projections of future economic growth.

If population growth continues heedless of the economic slowdown, opportunities for raising living standards will diminish or, in some countries, disappear. In some situations per capita consumption levels may decline in real terms. Once the economic pie is no longer expanding, the focus shifts to dividing it up. The political and social issues that subsequently arise can be very divisive and difficult to manage. In this critical light, population policy seems destined to receive much more attention than it has in the past.

"Migrants from destitute, overpopulated, and overcrowded rural areas are bearing the cost of society's failure to control human fertility."

. . . and Urbanization

During the nineteenth century industrial revolution in England, the flow of people from countryside to city was mainly a result of "urban pull,"—of job opportunities in the city. Today, the process of urbanization has accelerated in the developing countries, but it is more a measure of rural despair than of urban opportunity. Plots of rural farmland are divided and subdivided by each successive generation until the pieces are too small to provide a livelihood. The inevitable result is a rural exodus.

If projected trends materialize, the twentieth century will be the one in which human society is converted from a primarily rural society to one that is primarily urban. As a result of population growth and its attendant phenomena, the human habitat will be transformed from one in which most of mankind lives close to the land and to nature, to one that is primarily man-made, in which most of mankind lives in intimate but impersonal association with a vast number of other human beings, all dependent upon imported supplies of food, fuel, water, and raw materials.

Urban centers in Africa, Latin America, and part of Asia are growing at 5 to 8 percent yearly, almost regardless of the existing degree of urbanization. Populations in the developing areas are doubling every 25 to 30 years. But their large cities are doubling in size every 10-15 years, while the urban slums or shantytowns double every five to seven years. Projections for Lima, Peru, indicate a population of six million by 1990, three-fourths of which will reside in what were originally squatter settlements. Migrants from destitute and overcrowded rural areas are bearing the cost of society's failure to control human fertility.

The continuous migration of people from countryside to city in the poor countries constitutes a serious social crisis, the ramifications of which may eventually impair the quality of life of much of mankind. The present growth trend of most primary cities in developing countries can only lead to severe diseconomies, resulting in a

higher cost of living and increased per capita costs for urban facilities and infrastructures. Urban scholar Lewis Mumford estimates that
50 providing needed services costs three times as much in a large city as in a small town. Yet cities of over seven million people are more and more common in developing countries; examples include Shanghai, Peking, Calcutta, Mexico City, Rio de Janeiro, and São Paulo.

Deteriorating, overburdened urban services are beginning to break down everywhere from Calcutta to New York City. Slums and shantytowns, variously described in man's many languages as *favelas, barriadas, bustees, hutments, gecekondu, ranchos, sarifas, bidonvilles,* and *colonias proletarias,* are girdling and choking cities in virtually every nation of Africa, Asia, Latin America, and the Middle East. Their poverty-stricken inhabitants must contend with unemployment or underemployment, overcrowding, unhealthy housing conditions, poor transportation, inflation, insecurity, lack of educational or vocational opportunities, and a lack of sanitation, potable water, and low priced food and fuel, as well as the disintegration of traditional values and family life.

These side effects of rapid urbanization add to the strains and stresses imposed upon the migrant by an unfamiliar environment, loosened inherited social controls, and alienation from the customs and traditions of rural society. Most rural migrants are not readily absorbed into the urban, social, and economic system. Unprepared for urban living, they remain villagers in an urban setting.

Migrants make their way from shantytowns to the city proper at the same slow pace at which shantytowns are upgraded; the upwardly mobile represent but a trickle against the incoming flood. Accordingly, slum growth can serve as an index of frustration and as an indicator of potential instability, crime, and delinquency: all threaten the traditional concepts of personal security, property rights, and the civil order on which they stand. When the core of urban population is socially and economically alienated, not only the urban community itself, but also, inevitably, the national political climate will be affected.

As the size of cities increases, so do noise, air, and water pollution; and competition for goods, services, and space intensifies. This competition for space is evident in a comparison of various housing conditions in India, where the proportion of families living in dwellings of one room is 34 percent in rural areas, 44 percent in urban areas, 67 percent in the four largest cities, and 70 percent in Calcutta, the largest metropolitan area. Where the pressure of dense population is most evident, the quality of life has deteriorated most.

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Soon 80 percent of the low-income urban population of the developing countries, more than half of the world urban population, will be condemned to live in slums. An increasing percentage of children and youth are growing up in squalid surroundings, with little in the way of privacy, amenities, recreation, or education: theirs is a spiritless world where heat, light, and cleanliness are unaffordable luxuries.

52 . . . and Deforestation

As the human population has expanded over the centuries, the earth's forests have receded. Trees have been cut to make room for agriculture, to provide wood for shelter, firewood for fuel and, in recent centuries, newsprint for newspapers.

Most of the Middle East and North Africa, and much of continental Asia, Central America, and the Andean regions of South America are almost treeless. In these forest-poor areas, wood and its products are scarce and expensive; in all, the destruction of tree cover has taken a heavy toll on the environment and its ability to support people. With the exception of eastern Asia, principally China, the net loss of trees in these regions is accelerating.

The two principal causes of deforestation are directly linked to population growth: land clearing for agriculture and wood gathering for fuel. Tree harvesting for lumber is a third, but globally less significant, source of deforestation.

The rapid population growth of the past several decades has multiplied the need for cropland, grazing land, and firewood. Forests that once covered a third of the total land area of Morocco, Tunisia, and Algeria, for example, had been reduced to scarcely a tenth of the area by the mid-twentieth century. Though major reforestation programs are being attempted throughout North Africa, losses still outpace gains earned by new plantings.

Nine-tenths of the people in many of the poorest countries today depend on firewood as their chief source of fuel. And all too often, the growth in human population is outstripping the growth of new trees—not surprising, considering that the average villager needs nearly a ton of firewood a year. Trees have proved to be one of man's most valuable resources and, in consequence, one of the most heavily exploited. If cutting is excessive, both the forest and its capacity to satisfy human needs diminish. The question raised by rising

"The growth in human population is outstripping the growth of new trees—not surprising, considering that the average villager needs nearly a ton of firewood a year."

population pressure on woodland resources is whether humanity can recognize and respect those limits.

In sub-Saharan Africa, at least a third of the land is covered with grass: much of this savanna would still be forested had man not molested it. But as the number of hunters, herders, and tillers has grown, so has the cleared land: successive aerial surveys of the dense rainforest of the Ivory Coast show a reduction in forested area of 30 percent between 1956 and 1966. As a result of deforestation, whole ecological systems are threatened, as is the fertility and stability of tropical soils.

The Indian subcontinent provides another dramatic example of population stress. Over the past generation, the subcontinent has been progressively deforested; the soil's ability to absorb and hold water has subsequently diminished. More frequent and severe flooding has ensued. Deforestation has taken its greatest toll in the Himalayas and the surrounding foothills, where the subcontinent's major river systems—the Indus, the Ganges, and the Brahamaputra—originate.

Satellite pictures of Java indicate that as little as 12 percent of this formerly lush island now has tree cover. In the watersheds of the Solo, Brontas, and Citarum river systems, forest cover is well under 10 percent. An Indonesian ecologist, Dr. Otto Soemarwoto, has documented the acceleration of soil erosion in several watersheds, drawing special attention to a sevenfold increase over a recent three-year period in the silt load of the Citarum, which is rapidly filling up Indonesia's largest reservoir downstream at Jatiluhur.

As other Southeast Asian countries expand and adapt their irrigation facilities to meet burgeoning food needs, their vulnerability to siltation and disrupted river flows will grow commensurately. Satellite photographs of the Philippines show that deforestation is far more advanced than official statistics reveal, with the forest cover probably less than a fifth of the country's land area—a far cry from the 35-50 percent commonly assumed.

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In northern Thailand, forests are being decimated at an estimated rate of 5 to 7 percent a year. This deforestation rate and the projection of a 3 percent annual rate of population growth indicate future problems for Thailand: intensive, controlled irrigation will be most needed just when upstream erosion and an irregular water flow will make effective downstream management exceedingly difficult, if not impossible.

Areas such as the Middle East, which were densely settled long ago, lost their stock of trees in ages past. Today, many poor countries in other regions are passing through the same stages of forest destruction at a historically unprecedented pace. Though new barren landscapes will be created, there will be no new world to colonize and few virgin tropical forests to serve as foreign lumber sources. Like the Middle Eastern civilizations of antiquity, many countries are in the process of desecrating their landscapes to the point of no return. Once enough topsoil washes or blows away, the capacity of the land to support either trees or human beings is permanently impaired. Soil erosion, flooding, and silting of irrigation systems undermine food production efforts even as human needs become ever more pressing.

. . . and Political Conflict

As expanding populations exert more and more pressure on limited resources, both local and global, their impact on politics—the task of determining who gets what—becomes increasingly evident. Additional people place additional demands upon a political system at the same time that they impede that system's ability to respond satisfactorily. By constantly complicating resource allocation decisions, population growth can affect not only political stability within national borders but also the relations among states.

Rapid population growth in poor nations whose governments possess limited administrative and financial resources can severely strain efforts to improve agriculture, education, employment, or health care. Expansion of rural populations may inhibit broad land reform and income redistribution. Excessive population pressure on agricultural systems and the resultant overgrazing, deforestation, and soil erosion, can hinder programs to boost production, compounding rural poverty and the political problems it begets. Wherever economic expansion does not outpace growth in the labor force, meeting employment demands proves extremely difficult.

As the slowing of economic growth projected for most countries occurs, governments will find the problems induced or aggravated by population growth increasingly unmanageable. The consequent disputes over the distribution of inadequate food and/or other resources can easily contribute to the toppling of regimes, as has already happened in Niger, Chad, Ethiopia, and Bangladesh.

The difficulties of providing jobs for increasing numbers of potential workers plague many governments; rising unemployment among the expanding population of educated youths in India and Sri Lanka has contributed to repeated disturbances of varying scale. Though such unemployment-inspired unrest can by no means be attributed

to population growth alone, its solution is made more difficult by the need to accommodate large numbers of new entrants into the job market.

Population's role in international conflict has consisted of exacerbating existing tensions—and creating new ones. The 1969 war between El Salvador and Honduras was triggered by soccer riots, but the underlying cause was the wholesale migration of Salvadorans from their crowded country into less-populous Honduras, where they began asserting an economic importance offensive to Hondurans. The 1971 Indo-Pakistani War was detonated at least in small part by the sudden pressure placed on India's resources by the millions of East Pakistani refugees fleeing Pakistan's civil war.

Where population growth contributes to poverty and unmet demands, it may also encourage terrorism. Terrorism has long been a tool of those seeking power. Now it has become a survival tactic for poor people. In Colombia, police officials estimated that as many as 10,000 kidnappings took place in 1975, with the ransoms demanded often less than $100. One local spokesman quoted in the *New York Times* noted that "what is so terrifying is that one is not dealing with well-organized political groups but with bands of desperately hungry or diseased people who believe they have little to lose." More important than the headlines such acts have produced is the precedent they establish for similar demands. Given the range of destructive weaponry available to even small groups and the vulnerability of modern technological systems, the political stresses associated with continued population growth could acquire an increasingly international character.

Resource scarcity attributable in part to population growth acts as another potential catalyst of international strife. Conflicts over fishery resources were rare as long as there were more fish in the oceans than man could ever hope to catch. But now with scarcity prevailing, conflicts among countries occur ever more frequently. Among these is the cod war between the two NATO allies, Iceland and

"Conflicts over fishery resources were rare as long as there were more fish in the oceans than man could ever hope to catch."

Great Britain, resulting from Iceland's extension of its offshore fishing limits to two hundred miles. Similarly, Soviet fishing vessels have been seized by the U.S. Coast Guard within the U.S. twelve-mile territorial limits off the coast of Alaska. 57

The tuna war waged off the west coast of Latin America is long-standing. During one twelve-month period, the Ecuadorian navy seized and fined fifty-six U.S. tuna trawlers caught within Ecuador's unilaterally established two hundred-mile offshore limit. Competition between the expanding Soviet and Japanese fishing fleets in the north Pacific leads to frequent clashes. U.S. fishermen off the North American west coast face stiff competition from Soviet, Japanese, and Korean trawlers, and the U.S. Coast Guard frequently seizes foreign vessels caught fishing inside the territorial limit.

The global implications of resource scarcity were dramatized in 1975 by discussions of possible military intervention by the oil-deficit United States in the Middle East oil-exporting region. In early 1976, another cast of combatants is embroiled in resource-rich Angola, partly for ideological reasons and partly because of the oil and other resources found there. International conflict born of resource competition shows every promise of spreading to other theaters. Spain, Morocco, and Algeria are disputing their claims to the phosphate-rich Spanish Sahara. Access to the mineral-rich nodules of the ocean floor is a hotly-contested issue. Competition for water—in the form of artificial rainmaking and the damming of international waterways—is another political sore spot. Brazil, Argentina, and Paraguay have disagreed about the damming of the Rio Paraná. Mexico and the United States have disputed the waters of the Colorado River. Sudan's use of Nile River waters to irrigate reclaimed swamp land may cause tension with Egypt.

Little research has been done on the relationship between population growth and political conflict. As population pressures and political tension continue to build, the subject deserves far more attention than it has received to date.

58 . . . and Minerals

The earth's mineral resources remained untouched throughout most of the estimated two or three million years of human existence. Only in the last century have they been tapped systematically on a worldwide basis. Total mineral production during the last thirty years was greater than that from the beginning of the Bronze Age until World War II. The United States Bureau of Mines estimates that world consumption of aluminum will be twice today's level in nine years, that use of iron will double in a decade and a half, and that demand for zinc will double in 17 years. Consumption of these minerals is growing much faster than the world population, an indication of the substantial role rising affluence plays in the depletion of mineral reserves.

As mineral consumption grows, the indigenous reserves of those countries that industrialized first are being exhausted. In the nineteenth century, the United Kingdom was successively the world's foremost producer of lead, copper, tin, iron, and coal. Now the United Kingdom, the countries of Western Europe, and the United States rely increasingly on imported minerals.

Western Europe must import nearly all the copper, phosphate, tin, nickel, manganese ore, and chrome ore it uses. In 1950, the United States, with 152 million people, depended on foreign sources for more than half of its supplies of only four of the thirteen basic minerals required by a modern industrial society—bauxite, manganese, nickel, and tin. By 1970, potash and zinc had lengthened the list. U.S. Department of the Interior projections indicate that by the end of this century—when the United States population is expected to be 265 million—the country will be primarily dependent on imports for its supply of 12 of the 13 minerals, including iron, chromium, copper, lead, sulfur, and tungsten.

Estimates of the exact year that the earth's iron, copper or bauxite reserves will run out vary with the assumptions about future growth in demand, price, and technology used in making the estimates. Such

variations give rise to much of the recent controversy over the future availability of mineral supplies. The Club of Rome's study, *The Limits to Growth*, estimated that, even with a fivefold increase in known reserves, current rates of consumption will exhaust supplies of mercury in 41 years, molybdenum—a key component in steel fabrication—in 65 years, and tungsten in 72 years.

With changes in technology and price levels, the availability of any one mineral could increase or decrease significantly. As more efficient extraction techniques are developed, reserves expand. A price rise makes profitable the extraction of lower grade ores, expanding the size of reserves that can be mined economically.

Conversely, a rise in the price of energy, one of the principal factors in determining the cost of extracting minerals from the earth, can have the effect of reducing economically recoverable reserves. Many assumptions about the future availability of minerals are posited on the availability of vast quantities of cheap energy. An unlimited source of cheap energy would make feasible the extraction of minerals from small, rock-like nodules found on the ocean floor, from granite, or from deep mining. Unfortunately, the difficulties associated with fission and fusion power, the main hopes for cheap energy, suggest that they will not help expand mineral reserves in the foreseeable future. The environmental problems of nuclear waste disposal and soaring capital costs have caused the cancellation of nearly a dozen nuclear generating plants in the United States in the past year. Public opposition to nuclear energy has blocked construction of plants in France, the Federal Republic of Germany, and Sweden.

Relying on price increases to expand mineral reserves could prove economically destabilizing. Rather than making the mining of marginal deposits of minerals economically feasible, constantly escalating prices might create a situation in which the cost of minerals exceeds their value to society. If a mineral is readily available only at a price that triggers rampant inflation, availability becomes a largely academic concept.

60 Similarly, technological advances cannot be expected to expand supplies indefinitely. While reserves of some minerals will undoubtedly continue to grow in the future, it would be naive to assume that undiscovered working-grade deposits of astronomical tonnage exist for every mineral.

The future availability of mineral supplies at a reasonable cost will depend on expanding reserves and slowing growth in demand. The prospect of cheap, abundant energy that would effectively increase available reserves is fading. On the other hand, dependence on continuous price increases to expand supply would undermine many economies. New technologies—especially recycling, the potential of which has barely been tapped—present opportunities for limited stretching of mineral reserves. Yet the reality that mineral resources have limits is irrefutable, regardless of price and technology. If mined long enough any mineral resource must sooner or later be exhausted. These economic and technical supply problems underscore the importance demand plays in any consideration of the future adequacy of mineral resources.

"Rural Kenya has only one doctor for every 50,000 people."

. . . and Health Services

For hundreds of millions of people, perhaps half of the world's population, health care is unavailable or is a luxury they cannot afford. In many countries, the number of persons requiring medical care is growing much faster than available health services. This lack of health care is more than a matter of statistics; it is the agony parents endure watching a three-year-old child die of a common childhood disease like measles or diarrhea. It is a father chronically debilitated by intestinal parasites, malaria, or schistosomiasis while struggling to produce enough grain to feed his family.

Population growth affects health in many ways. Women who have large families often start childbearing early in life. Teenage mothers have higher mortality rates and suffer a greater incidence of disease than mothers who are more mature. Crowding, when accompanied by poor sanitation, fosters the spread of infectious diseases. Large family size strains food budgets and leads to poor nutrition, which in turn weakens the body and makes it vulnerable to disease.

The inability to provide adequate health services plagues many poor countries.

- Rural Kenya has only one doctor for every 50,000 people. Even if the number of doctors in rural areas triples in the next twenty-five years, an expensive and probably unattainable goal, current rates of population growth would make it impossible to deliver in the countryside even the same level of service that people now receive in the capital city, Nairobi.

- A recent survey in Thailand indicates that public health facilities reach only 17 percent of the people. With a population expanding at 3 percent a year, or nineteenfold in a century, that segment of the population that never sees a doctor is mushrooming.

- In Guatemala, the average citizen visits a hospital or dispensary only once every five years. Since there are six times as many doctors in the cities as in rural areas, the rapidly growing village population is doomed to life without medical services.

- In Colombia, where the birth rate is 40 per thousand and the infant mortality rate is high, one effort to improve health care was to construct in Bogota one of the finest centers anywhere for the care of premature babies. In this facility, the number of infant deaths has been reduced to a European level. Unfortunately, because of the large number of babies born every year, this excellent care cannot be continued after the children leave the hospital. Consequently, almost three-fourths of the infants who receive special treatment die within three months of returning to their parents' homes.

Faced with the overwhelming task of providing housing, education, and employment for twice their present populations by the end of the century, most developing nations will have little time, expertise, or money to expand health services. In many countries, governments will have trouble just maintaining the current level of inadequate health care. Limited equipment, medicines, trained medical personnel, and clinic facilities cannot be miraculously stretched to serve all who need them.

A policy in many poor countries of concentrating limited health resources in showcase urban facilities, modeling health care on the best available service in London or Paris, does not squarely face the health care problems posed by recent rapid population increases. Lavishing limited health care budgets on expensive facilities and a small coterie of doctors and specialists has made it impossible for governments to meet the health needs of more than a small fraction of their populations.

In China, expensive services and sophisticated, exclusive facilities are now given low priority. Health care focuses on public sanitation, health education, family planning, and small clinics directed by paraprofessionals—the so-called barefoot doctors—who provide inexpensive health services that are easily accessible to everyone. This approach, dictated by the inadequacy of traditional health care, has helped lower the death and infant mortality rates. The encouragement of family planning, as a part of overall health service, has led to a dramatic reduction in the birth rate, easing future pressure on health services.

Some 70 million would-be consumers of health care are added to the world's population every year. The immediate economic prospects of poor countries and the long lead times involved in implementing traditional health care strategies suggest that attempts to supply fast growing populations with medical care will fall farther and farther behind demand. A paraprofessional approach to health service should help meet some of the new demand, but few countries can be expected to match China's large scale effort. Unless population growth is slowed, even a paraprofessional approach to health service will be a losing battle.

Brooklyn, New York, was a sparsely populated village in the nineteenth century and, like most communities, supplied itself with fresh water by sinking wells to tap what then seemed like an inexhaustible supply of underground water. As the area changed from a collection of small farms to a heavily populated borough, expanding demand slowly lowered the level of underground fresh water, and salt water seeped into the city's supply, rendering it useless. With no other source of drinkable water, Brooklyn was forced to obtain its supplies from distant sources in upstate New York, an area with fewer people and fewer demands on its water supply.

As the New York metropolitan area expanded, Queens County, adjacent to Brooklyn on Long Island, grew. Once self-sufficient in water, it too was soon forced to turn to reservoirs in northern New York. Now Nassau, the county next in line on Long Island, has too many people and not enough water. In the early 1970s, Nassau's million and a half people used about 150 million gallons of water a day. By 1990 its 1.8 million people will need almost 250 million gallons of water daily, or 90 million gallons more than local rainfall in the area provides. Nassau County is going the way of Brooklyn and Queens. The water needs of a growing population are rapidly outstripping supply.

Examples of population growth exerting pressure on water supplies are legion. From Manila—where the population may double in fifteen years—to the grazing range of the Ethiopian Plateau, the limited availability of fresh water is undermining health, restricting food supplies, and diminishing hopes for economic development.

Every person added to the world's population requires a minimum amount of water to survive. Drinking water is only a minute part of a person's daily water needs. Producing enough food to keep one person alive requires enormous quantities of water. Up to 120 gallons

"In the northern Great Plains of the United States, ranchers and coal mining interests are waging court battles to determine who will get to use scarce water."

of water are needed to grow the grain used in a loaf of bread. A pound of meat, which requires direct water consumption plus water to grow the animal feed, can require 200 times that amount. Energy production is often dependent on water availability, and the production of most consumer products, from plastics to steel, requires a great deal of water. Per capita daily water use in the United States has increased more than 75 percent in the last twenty-five years. World water use is expected to triple by the early twenty-first century if projected population and per capita consumption trends materialize.

Population pressure on water supplies is most evident in agriculture, with irrigation needs representing one principal source of future world water demand. Satisfying these needs will prove increasingly difficult in the years ahead because most of the best irrigation sites in the world have already been developed. Irrigated farm land, which expanded by nearly 3 percent per year during the sixties, will be developed more slowly in the future. Indeed, the shortage of fresh water for irrigation will severely constrain efforts to expand world food supplies during the remainder of this century.

As the demand for water in agriculture grows, it is meeting vigorous competition for available supplies from efforts to expand energy production. In the northern Great Plains of the United States, ranchers and coal mining interests are waging court battles to determine who will get to use scarce water. Proposed plants to convert coal into natural gas would consume vast amounts of water.

Many water resources serve multiple, and often conflicting, functions. Lake Nakuru, one of Kenya's most famous lakes, is a natural wildlife preserve and a source of fresh water. It is also a cesspool for human waste and a catchment basin for agricultural runoff. The lake has no natural outlet and is thus very sensitive to the inflow of pollutants. Already the flocks of flamingos that made the lake famous as a bird sanctuary have fled the region, unable to withstand the man-made pollution of the lake. Other waters around the world face similar competition from recreational, industrial, and fishing inter-

ests. Abusive use of a water resource by one element of the economy can leave it unsuitable for use by others.

66 In developing nations, the demand for water to grow food will soon come into conflict with the needs of industrialization. Where water-intensive heavy industry, such as steel-making, becomes the focal point of development, the competition between agricultural and industrial water needs will intensify.

The prospects for meeting the growing need for water over the long-run look bleak unless current trends change significantly. Examples of depletion of fresh underground water supplies appear frequently. In Polk County, Florida, the water table fell 21 feet in recent years, as the giant amusement park Disney World and other developments drew new residents into the area. Local scientists predict that if the county's population grows 50 percent in the next decade, as expected, "catastrophic water shortages" will develop. In the past, localized water scarcities meant digging deeper wells and shipping water over longer distances. Bangkok has long relied on wells and a steady flow of river water from mountains to the north to meet its needs. Now, with agricultural irrigation projects drawing off enormous quantities of the Chao Phraya River's waters before they reach the city, and its wells already overtaxed, Bangkok has nowhere to turn to supply its population, which could double in a little over a decade.

Developing new sources of fresh water is expensive, is fraught with uncertainties, and can provide only temporary relief from the pressure of growing demand. Tapping fossil water, trapped for centuries in underground rock formations, opens a Pandora's box of environmental problems. Extensive desalinization of water is prohibitively expensive in the absence of a cheap source of energy.

The growing competition for limited water resources makes some talk of a water crisis inevitable. Opportunities for water savings are great in most countries, but strategies for balancing demand and supply will not succeed without concerted efforts to slow population growth.

"In many developing countries, entrants into the job market outnumber new jobs by two to one."

. . . and Unemployment

During the spring of 1973, when a national election campaign was in progress in Colombia, the *New York Times* reported that both major political parties had opened campaign offices in New York City in order to solicit votes from the estimated 80,000 Colombians residing illegally in the city. For New Yorkers, this dramatized the difficulty that developing countries have in providing jobs for their rapidly expanding populations.

The U.S. Immigration and Naturalization Service estimated in 1974 that 7 to 12 million illegal immigrants reside in the United States. As many as two-thirds are Mexicans. The willingness of millions to sever ties with their home communities, their cultures, and often their families to submit themselves to the humiliation associated with illegal immigration indicates the extent of their desperation.

A similar, though mostly legal, migration has occurred in Europe. Workers from the pre-industrial Mediterranean countries with rapid population growth have moved to industrial countries like France, Germany, and Switzerland. In 1975 an estimated 10 million or more "guest workers" from a number of developing countries, including Algeria, Turkey, Yugoslavia, Spain, and Portugal, earned their living in Northern Europe. Whenever economic growth slows in the host countries, many guest workers find themselves jobless and forced to return to unpromising prospects at home.

During the mid-seventies recession, over 17 million workers, the highest number in forty years, were unemployed in eighteen industrialized European countries, North America, Japan, Australia, and New Zealand. The continuously expanding corps of jobless is becoming a grave social onus. In many developing countries, entrants into the job market outnumber new jobs by two to one, thus creating levels of unemployment and underemployment far greater than ever before experienced anywhere.

Economists estimate that for every 1 percent growth in the labor force, a 3 percent rate of economic growth is required to generate jobs. With current technology, countries experiencing a 3 percent

rate of population growth therefore require a 9 percent rate of economic growth just to maintain employment at its current level. Attaining full employment would require an even faster rate of economic expansion. But economic growth rates have been falling during the seventies rather than rising; fewer jobs are being created even while the number of potential workers is climbing at an unprecedented rate.

In Latin America, the first region to experience rapid population growth, the number of unemployed tripled in the fifteen years from 1950 to 1965, climbing from 2.9 million to 8.8 million. The rate of visible unemployment went from less than 6 percent to over 11 percent during this period. Available data indicate that the tide of the unemployed is continuing to swell.

India's labor force is projected to increase from 210 million to 273 million during the seventies. Already plagued with widespread unemployment and underemployment, India is now beleagered by 100,000 new entrants into the labor force each week. According to economist Harry T. Oshima, at least 15 percent of the labor force is jobless in Pakistan, Sri Lanka, Malaysia, and the Philippines. One-third of Bangladesh's available manpower may be unemployed. Indonesia's working-age population is growing by an estimated 1.8 million annually; one-fourth of the nation's potential labor force may now be out of work.

Looking at the developing nations as a whole, the International Labor Office (ILO) estimates that 24.7 percent of the total labor force was either unemployed or underemployed in 1970. The comparable figure for 1980 is expected to rise to 29.5 percent. Yet, the labor force in the less developed nations is projected by the ILO to expand by 91 percent between 1970 and the end of the century, nearly doubling within the span of a single generation. The labor force in the more developed regions is expected to increase by only 33 percent during this period.

Further aggravating the problem, the number of persons requiring non-agricultural employment in developing economies will increase

from 342 million in 1970 to a projected 1,091 million in the year 2000, a staggering increase of 219 percent in one generation. Few, if any, developing countries have the kind of investment capital needed to generate new jobs at such a fast pace.

Projected Growth in World Labor Force, 1970-2000

	1970	2000	Additional Jobs Required	Change 1970-2000
	..... millions			percent
More Developed Nations	488	649	161	+33
Less Developed Nations	1,011	1,933	922	+91

Source: International Labour Office

Diverting a high proportion of a country's earnings to educate, feed, clothe, and house a large population of children impoverishes the workers and inhibits employment-creating investment. Other things being equal, the amount of savings for productive investment tends to grow more slowly where population growth is rapid.

The effects of job scarcity at the personal level are tragic. Jobless Mexican peasants allow themselves to be slipped over the U.S. border in automobile trunks and packing crates, ripped off by smugglers of human contraband, and exploited by unscrupulous employers. When men from southern Italy leave behind their wives and young children in order to send home better pay packets from dingy boarding houses in Germany, their family life is reduced to an awkward annual visit, and their children grow up as strangers.

Unemployment is frustrating, dehumanizing, and politically destabilizing. Lack of meaningful employment deprives people of dignity and a sense of worth, stunting their spirit and creative potential. Yet reducing birth rates and instituting progressive economic policies can both increase the capital available for creating jobs in the near term and eventually reduce the number of jobs needed.

. . . and Endangered Species

70 The word extinction brings to mind the dinosaur, felled by gradual climatic changes over a long period of time. Today, this process of extinction has been reduced to decades. *Homo sapiens*, a single species, threatens the survival of countless thousands of plant and animal species through its numbers and activities. The addition of three-quarters of a billion people to the world's population over the last decade has, in many regions, upset the balance between human, plant, and animal life. The very size of the human population is altering natural environments: rural habitats are urbanized, forests are turned into farmland. The chemical wastes from manufacturing and commerce, and the widespread use of pesticides and fertilizers to improve nature's productivity threaten to break the life cycles of many species.

Public attention focuses on a few, widely publicized efforts to conserve dying species and overlooks the thousands of less well-known plants and animals now threatened with extinction. The number of endangered wildlife species added annually to a list compiled by the International Union for the Conservation of Nature and Natural Resources greatly exceeds the number removed from it through conservation efforts.

As part of the evolutionary process, extinction is natural. The earth's history is one of species evolving, flourishing, and disappearing. But recent studies suggest that extinction is no longer a slow process. The number of plant and animal species threatened with extinction now far exceeds the number of new species appearing.

The accelerating process of extinction is widespread.

- Forty years ago, approximately 40,000 Bengal tigers roamed the Indian subcontinent. Now there are fewer than two thousand. Since every Bengal tiger requires at least ten square miles to forage for game, the spatial needs of the tiger now compete with India's growing demand for farm land and living space.

"As more and more species are jeopardized, the odds mount that the complex web of life that supports man may be dangerously and irrevocably disrupted."

- Southern Florida's population has more than tripled in the last twenty-five years. The shopping centers, highways, and golf courses spurred by this growth have overwhelmed many plant species; over half of southern Florida's plant species now verge on extinction. Nationwide, the Smithsonian Institution estimates that a tenth of the 20,000 species, sub-species, and varieties of plants native to the United States are threatened with extinction.

- In Kenya, the human population density in the savanna is now increasing alarmingly. In the struggle to produce more food, farmers there plow grasslands that are the home of most of the country's big game. African naturalists fear that the consequent loss of fresh water supplies and open land will gradually eliminate wildlife.

- Central America has lost nearly two-thirds of its tropical rain forests, areas harboring unique plant species. The expansion of agriculture and timbering may soon destroy the biological diversity of the tropics, breaking down the intricate interrelationships that permit plant and animal life to flourish despite poor soil, high temperatures, and heavy rainfall. Many tropical plant and animal species have never been studied. They may disappear before humans fully understand their contribution to our complex ecological system.

The process of extinction is not solely an aesthetic problem. Many plants and animals are vitally important to human well-being. Plankton form the crucial foundation of the ocean food chain, but oceanic pollution is growing faster than man's ability even to analyze its effects, much less control it. Many marine biologists fear that pollutants could destroy ocean plankton. Thor Heyerdahl, a noted Norwegian explorer and scholar, has made the point poignantly: "Take away this indispensable life in the shallow surface areas of the sea and life ashore will be unfit for coming generations."

Plant genetics and biochemistry help to feed the world and to protect human health, providing crucial genetic material necessary for sci-

entific advances. It is difficult to predict which plants might prove helpful to man in the future. The cinchona tree of Latin America was considered useless until it was discovered that quinine, which can be extracted from it, effectively suppresses malaria.

It is tragically ironic that in many countries where increases in agricultural production are most needed, population growth is even now destroying important native plant species. At a time when millions of dollars are being spent to develop food crops that can be grown in the Andes or in desert environments, the world can little afford the loss of those species that have already adapted to harsh habitats.

The risk to man posed by the extinction of plant and animal species cannot be easily quantified. When extinction is a slow natural process, human beings and the environment can adjust. As more and more species are jeopardized by man's increased numbers and ecologically disruptive activities, the odds mount that the complex web of life that supports man may be dangerously and irrevocably disrupted.

. . . and Energy

Every person added to the world's population requires energy to prepare food, to provide clothing and shelter, and to fuel economic life. The amount of energy used every day by the world's four billion consumers, for everything from heating water to running the most sophisticated computers, is rapidly increasing. Each increment in demand is another claim on shrinking energy reserves.

The squeeze on energy supplies is being felt all over the world. In the shadow of the Himalayas, the pressure of population growth is depleting firewood resources at an alarming rate. Nitrogen fertilizers derived from fossil fuels are often too expensive to be used by poor farmers in Asia, Africa, and Latin America, where they are most needed. Estimates of proven United States petroleum reserves have been scaled down in recent years, while population continues to grow.

Prior to the early seventies, there was little concern about future energy supplies and people were unmindful of the role energy played in their everyday lives. Known global reserves of petroleum, natural gas, and coal were expanding and most projections showed that reserves would continue to grow as the price of energy rose and new technology became available. Plentiful, cheap energy permitted the world to grow populous and affluent. Fossil fuels, particularly petroleum, fired economic growth. Nitrogen fertilizer, produced cheaply from natural gas, boosted agricultural productivity in the corn fields of Iowa and in the rice paddies of the Philippines.

With disarming suddenness the global shortage of oil brought on by the 1973 Middle East embargo woke the world from its energy daydream. Lines at gas stations in the U.S. and farmers waiting for days to buy fuel for irrigation pumps in India forced a reappraisal of the global energy situation. Optimism over energy reserves faded as pessimism over supplying ever larger populations with sufficient energy grew.

74 Perhaps the least recognized facet of the world energy problem is the scarcity of firewood, the primary fuel for a third of mankind. Firewood has long been a source of energy for the poor all over the world. Today, swelling populations have progressively pushed back the forests that once ringed many villages in developing countries. In some areas, villagers must now spend a day or more to get a bundle of wood. As population growth continues, the energy problems of the poor multiply.

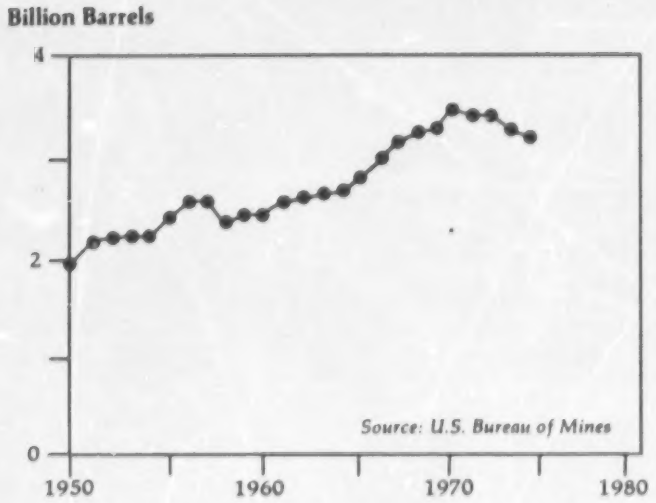
The effort to increase world grain production by 30 million tons each year in order to keep pace with growth in demand requires vast quantities of energy. As population growth continues and the amount of new agricultural land dwindles, additional food needs must be met by cultivating existing farm land more intensively. Maximum cultivation in turn generates heavy new demands for fertilizer, irrigation, and other energy-intensive agricultural inputs.

Population-related energy problems are not confined to the poor countries. When population growth occurs in societies where wealth and technology have led to energy-profligate lifestyles, the added demand on limited energy supplies is inordinately large. Even a modest population increase in the United States precipitates a heavy drain on world energy reserves.

Growing numbers of consumers are using up the world's finite energy resources more and more rapidly. World oil extraction has doubled every decade of this century and is now taxing declining reserves. Estimates of proved recoverable oil reserves in the United States differ markedly, depending on their source, creating doubt about long-range oil availability. Domestic petroleum production peaked in 1970 and has been declining ever since. (See Figure.)

Countries historically energy self-sufficient, such as the United States and Romania with its once-rich Ploesti oil fields, are steadily depleting their reserves of oil, becoming dependent on imported supplies. Countries with rapidly growing populations often have only scant energy resources. Less than 3 percent of the world's known coal

"When population growth occurs in societies where wealth and technology have led to energy-profligate lifestyles, the added demand on limited energy supplies is inordinately large."



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U.S. Petroleum Production, 1950-74

reserves are in Africa and Latin America, where population growth is rapid. As this growth creates additional demand for energy, countries often have little alternative but to turn to vulnerable and high risk energy sources, such as nuclear power. Without some effort to moderate population growth and limit growth in demand, the world faces a precarious and uncertain energy future.

. . . and Individual Freedom

76 As more and more people require space and resources on this planet, more and more rules and regulations are required to supervise individual use of the earth's resources for the common good. This need to agree upon or impose guidelines and limitations is seemingly independent of political ideology. And the sphere encompassed by such regulations is an ever-widening one that includes individuals, large industries, and now, in some instances, the entire world.

To safeguard the environment, regulations limiting industrial pollution have been established. In many countries, costly changes have been imposed on the steel, pulp paper, and petrochemical industries, among others, to enforce compliance with new pollution guidelines. Local governments in the United States, representing the interests of their constituencies, now have the authority to shut down plants when air pollution exceeds specified limits, or when plants continue to pollute in violation of the environmental statutes. The Birmingham, Alabama, steel mills were temporarily closed because of a pollution emergency. Zinc and lead smelters have been closed permanently because of failure to comply with new environmental protection requirements. This curtailment of industry's freedom to operate independently of any public accountability reflects the importance of monitoring and protecting the environment carefully as more and more demands are made upon it. Industrial activities and decisions are no longer the private bailiwick of corporate executives.

Requirements for the common good have also filtered down to the individual level in the form of hunting permits, fishing licenses, health certificates, driver's licenses, and building permits, to cite a few. Building codes set legal standards for private edifices; now such standards are being elaborated to mandate energy conservation as well. Automobile speed limits, originally designed to foster safety, have now been made more stringent to conserve energy. Emission control devices are now required equipment on automobiles in many countries. In the United States, auto manufacturers are being forced to increase fuel efficiency. Ever more environmental regulations govern private and public waste disposal; autumn leaves cannot be

burned, nor trash dumped, indiscriminately. Yet a half century ago, such rules would have been unimaginable.

Land use provides another obvious example of encroaching regulation. Zoning laws regulate the use of privately owned land. Sewer moratoriums have effectively prevented some landowners from developing their property. Limitations on water rights have blocked the attempts of mining companies to excavate mineral deposits, as has strip-mining legislation.

The emergence of unprecedented scarcity in societies predicated on abundance could entail far more drastic restrictions of customary liberties. Such scarcity demands that humanity eventually achieve a "steady-state" relationship with nature, which in itself may require the strictest economic and technological husbandry, as well as the strictest sort of political control. As political scientist William Ophuls has noted, spokesmen for underprivileged groups understand the link between scarcity and oppression quite well, and react violently to any suggested production slowdown.

The need for more extensive political control is painfully illustrated by the tragedies born of the unregulated use of common resources like air and water. A finite world pressed by the needs of increasing numbers of inhabitants can no longer afford such uncontrolled self-seeking, a Hobbesian universe of the war of all against all. The new political strictures required to cope with the "tragedy of the commons" may necessarily abrogate some forms of freedom. The probable extent of such abrogations can only be speculated upon. Singapore has adopted a program of strong incentives to achieve population stabilization. The Indian government has been considering the idea of enforced sterilization after three children. To save energy, California now prohibits the construction of heated swimming pools.

Human numbers and the scale of human economic activity have now reached the point where necessary regulations affect individuals and nations alike. Governments are being forced to work together at the regional and global levels to regulate use of the waste-absorptive capacity of both the atmosphere and the oceans. Rules and

agreements among countries are required to regulate use of fresh water supplies, including shared rivers and common cloud cover. The use of forests, fisheries, energy reserves, and food stocks also call for intergovernmental regulation and agreements. Although decisions on these broad issues must be made at the international level, their impact will be felt at the individual level.

In sum, population-induced scarcity makes "muddling through" in a basically laissez-faire socio-economic system no longer tolerable or even possible. In a crowded world menaced by ecological stresses and resource scarcities, the only alternative to self-discipline in consumption and procreation may be a situation in which the grip of planning and social control will of necessity become more and more complete.

One possible result of the re-emergence of scarcity may be the resurrection in modern form of the pre-industrial polity—a polity in which the few govern the many and in which government is no longer of or by the people. From the effects of population pressure, Robert Heilbroner, in *An Inquiry Into the Human Prospect*, has inferred that military-socialist governments are the only regimes capable of establishing workable economic and social systems. And from the difficulties and dangers of continued growth, he anticipates a drift toward authoritarian measures as the only means by which a suicidal Hobbesian struggle might be avoided.

Given the irresistible pressures of population growth and rising affluence and the constraints of resource scarcity and environmental limits, it seems entirely possible that new social systems will emerge. They may incorporate a higher level of regimentation with a new set of motives and objectives, blending "religious orientation" and "military discipline." One example of this new civilizational form may be China, with its careful control over economic activity, place of residence, and choice of occupation; its economic policy calculated to restrain rather than whet individual consumptive appetites; and, above all, an organizing religiosity expressed through the observance of a socialist credo.

This inventory of the many consequences of population growth underlines both the complexity of the problem and the urgency of efforts to slow population growth everywhere. In effect, the population problem is not one but many. Its many facets often interact, amplifying each other.

Each person added to the world's population puts at least some additional pressures on the earth's resources, on its food, energy, water, and space. If the person is affluent, then the pressure on resources will be far greater than if the person is poor.

The population problem is not exclusively a local problem, though its manifestations are most visible at the local level. Some consequences of the population problem are clearly global. Inflationary pressure, climatic change, and oceanic pollution are but three of many.

Population growth threatens rich and poor alike. Pollution affects everyone; there are no ecological islands. Though inflation affects both rich and poor, what may be merely an inconvenience for the rich actually undermines the survival of the poor.

This analysis suggests strongly that the threat posed by population growth deserves much more attention than it is now getting. Leaders can no longer afford the luxury of insisting that population is someone else's problem or that it can only be solved by future generations. Current population growth rates cannot continue for much longer. Birth rates will come down, death rates will go up, or, more likely, both will occur. Increasing nutritional stress, environmentally-induced illnesses, and social disintegration can all contribute to rising death rates and falling birth rates.

As the dimensions of the population problem become more apparent, some national political leaders are beginning to respond. Perhaps

the most encouraging development over the past year has been the sharp increase in requests from the developing countries for assistance in family planning. The principal aid agencies in this field —the United Nations Fund for Population Activities, the International Planned Parenthood Federation, and the U.S. Agency for International Development—are being overwhelmed with requests for assistance. As of 1976, the principal constraint on efforts to make family planning services available to all who want them is not so much apathy in the developing countries as a lack of financial and technical assistance from the rich countries.

National and international leaders can no longer dodge the peril inherent in continuing rapid population growth or shrug it off with irresponsible optimism. The problem concerns us, but it will concern our children and grandchildren even more. How we respond to the population threat may do more to shape the world in which they will live than anything else we do.

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